The
# Electrical Review

VOL. CXIV. APRIL 13, 1934. No. 2942.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, WATLOO, LONDON." Code, A B C. Telephone No.: Hop 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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## Electrifying Heavy Industries

THE official inauguration of the supply to Corby steelworks, on Tuesday, marked an achievement of much more than local significance. The Kettering U.D.C., in securing a consumer that will increase its sales fivefold, raises itself out of the class of small undertakings; at the same time it advances the interests of an important ratepayer and electrifies the homes of numerous employés living nearby.

Although the tariff of the Central Electricity Board for a consumption of 75 million kWh may not allow much margin of direct profit to the undertaking, it can hardly fail to bring some pecuniary advantage, due to diversity of the steelworks' demand with that of its ordinary consumers.

The case for a complete supply from public mains to a steelworks is one of the most difficult to substantiate. As similar opportunities will, we believe, occur to other undertakings elsewhere, however small, to secure heavy industries as consumers, we would recommend a study of the factors that made for success in the present instance.

First of all we have the attitude of the C.E.B., which was prepared to quote a tariff low enough to permit the undertaking to secure the business and to enable it to deal with a load that could not have been accepted by a small station, even apart from the "bumps" caused by large mill motors.

Next we have the appreciation of the magnitude of the development shown by Mr. W. A. Walker, the Kettering electrical engineer, which caused him to seek the assistance of a firm of consultants with special experience in industrial agreements and in the design and supervision of h.v. construction. Mr. Walker was thus able to devote himself to managing his undertaking and to maintain its satisfactory rate of development, which is indicated by an increase during the past four critical years of 40 per cent. in output (although about half is sold for motive power) and 75 per cent. in the number of consumers.

He was also free to use his local knowledge in securing wayleaves in advance, and this enabled Messrs. Arthur Ellis & Partners to start the contractors on the work immediately after the approval of the agreement, and to carry through the work with expedition.

The final factor in the success was the attitude of Messrs. Stewarts & Lloyds in basing their decision to take a public supply on a clear issue of overall economics—a decision that was, no doubt, influenced by the excellent technical scheme drawn up by their electrical engineer, Mr. W. B. Green, for utilising the supply.

It is part of the duty of the Central Board to facilitate supplies to heavy industries. This aspect is altogether removed from that of retail distribution, which has come to the fore recently; the Board is essentially, making a supply available at another grid point under the 1926 Act in the Kettering area. We do not suppose that the supplies to Corby and to Messrs. J. & P. Coats, at Paisley, to which we referred in our issue of September 22nd, 1933, will be the last of such arrangements.

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**Sound Hire-Purchase**

THAT hire-purchase methods possess special advantages in encouraging the use of domestic electrical appliances has been amply demonstrated, and little need be said in criticism of the application of the principle. But it requires to be fully recognised that schemes should be well thought out, and prepared on more or less expert financial and electrical lines, with special attention paid to maintenance matters. Some classes of electrical appliance business, especially in poor areas, cannot be expected to make rapid progress if outright purchases in cash are expected. Mr. C. E. Gorham, of the Bankers' Commercial Security, has been addressing the Manchester Rotary Club on the general question, and he has directed attention afresh to the increasing application of the hire-purchase system by small manufacturers who want to extend or to renew their factories and equipment without adding to their capital commitments. The subject is timely, because of the hope that credit finance will help forward the industrial re-

covery movement that is now in evidence. Mr. Gorham is of opinion that hire-purchase arrangements will become a more and more important part of the credit structure of the country; but generous aid will require to be tempered by sound commercial conditions. It is not wise to lead the householder to accept something that he does not really want, and cannot afford, purely because the way to obtain it can be made easy. The man or woman of good credit, who is convinced of the advantage accruing from the use of certain apparatus, is the best class of hire-purchaser. Electricity supply undertakings cannot build up satisfactory business with unreliable clients, and all the zeal in the world will not justify placing too much faith in those who are not stayers.

**Engineering and Ingenuity**

Several notable departures from ordinary practice are to be found at Brimsdown "B" power station, which is described in a later page. Operating results have steadily improved since the taking-over tests were passed, and under normal load boiler-house efficiencies exceeding 88¾ per cent. and weekly thermal efficiencies of close on 24 per cent. are now obtained. Last year more than 264 million kWh was generated at this station. The feature that most impressed us during our visit was the provisions made in all sections of the plant for centralised control, which is as important in an emergency as it is in securing the highest efficiency. The capital cost of Brimsdown B was only a little more than £12 per kW—concrete evidence that high thermal efficiency does not necessarily entail heavy expenditure. The modifications recently made to some of the auxiliary plant show that there is plenty of scope for engineering in the operation of a power station.

**All-electric Flats**

It cannot be said that West London has been very progressive in the domestic electrical sense. There has been plenty of lighting, but heating and cooking have not developed so rapidly as in some districts farther East. Now, however, there is a definite move to make up for lost time, and nearly every week we hear of the opening of new all-electric (or nearly all-electric) flats. The latest news of this nature was Mr. W. R. Davies's statement at the annual meeting last week of the Chelsea Electricity Supply Co. that the company had decided to build a block of all-electric flats in the vicinity of Cheyne Gardens. These, he said, would serve the dual purpose of educating the public in the value of electrical service and of increasing the company's revenue. We wish the scheme success and commend it to the attention of the other London electricity supply companies.

**Grid Operation**

The cost of giving small supplies from the grid should be materially reduced by the development of 132-kV oil-blast fuses and of 33-kV outdoor metal-clad switchgear for extensible single-switch substations, which form the chief technical features of the annual report of the Central Electricity Board issued yesterday. The "teething troubles" have been no more than might have been expected from the magnitude of the work, the training of the operating staff, and the effect of drought on line insulation, to which we have previously referred. It is anticipated that the total cost (including frequency standardisation) will be within the £50 million estimated, which means that most of the additional £10 million which the Board is empowered to spend will be available for extending the grid.

**The Increasing Output**

The increase of 19.6 in kWh generated in March over the figure for the corresponding month of 1933 brings the total advance for the first quarter of this year to 16.9 per cent. During the four years ended last December the output in this country has increased by almost 30 per cent., compared with an increase in world output of less than 5 per cent. Some of our recent progress is no doubt accounted for by change-overs from private to public supplies, but by far the greater proportion is due to industrial activity backed by accelerating domestic electrification. The growth of load in the Central Scotland and Mid-East England Areas, in which grid trading was in operation all last year, has given a credit revenue balance to the Central Board; but too much weight should not be attached to this, as the Board—like any other supply undertaking—has to frame its tariffs so that a return is provided over a relatively long period, *i.e.*, an undertaking must not expect to pay its way from the beginning, except in a retrospective sense.

**May Instead of February**

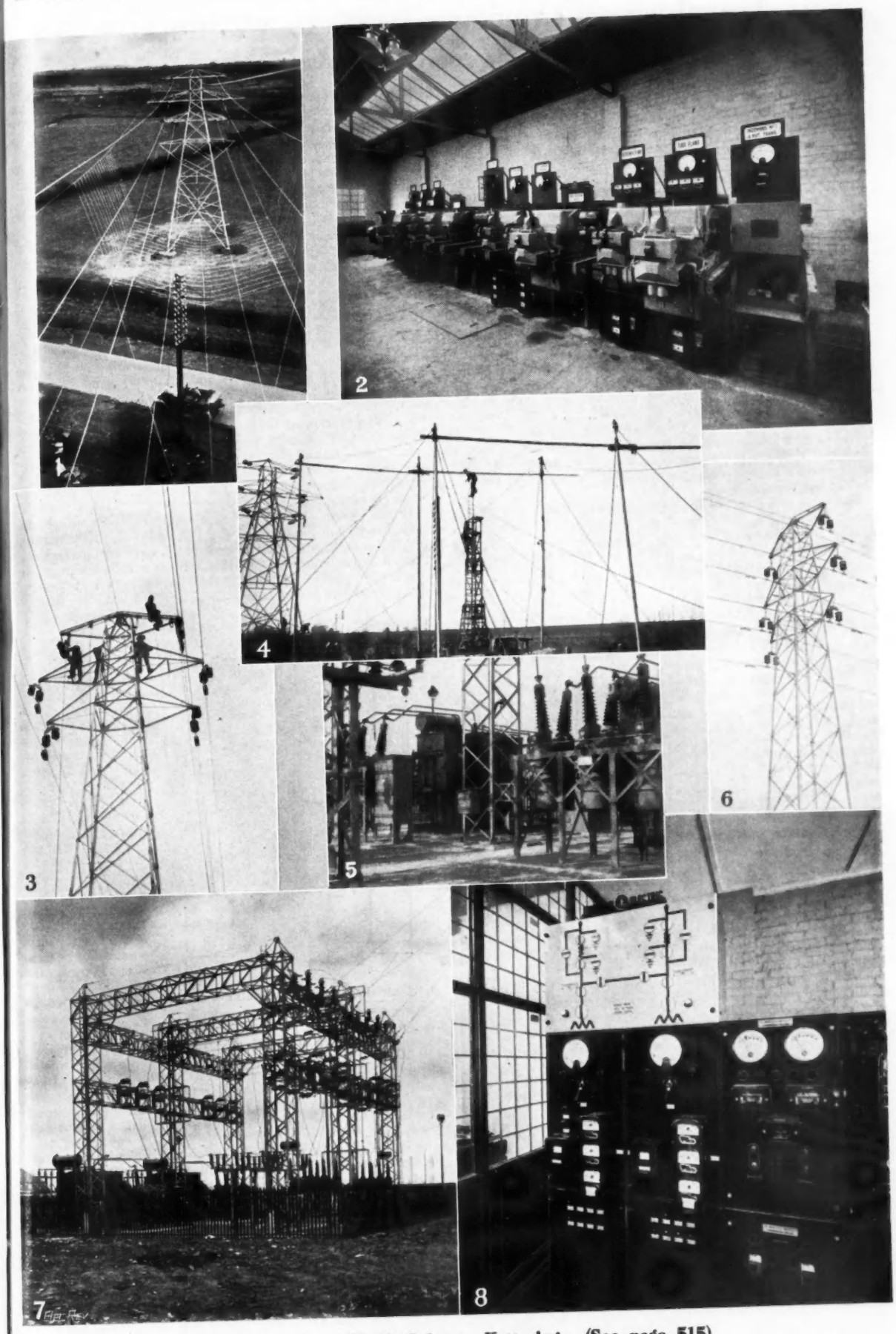
Next year the Birmingham Section of the British Industries Fair will take place at the end of May instead of in February. The decision, which has just been announced by the Department of Overseas Trade, is of special interest to the electrical trade, from which an appeal for a change has been made from time to time in the belief that the number of visitors from overseas would be much larger if the whole Fair were shifted to the summer. It will be remembered that the Chelmsford Committee, after hearing a good deal of evidence, was unconvinced that British industry generally desired any alteration, and the present decision in no way affects the London Section, which in 1935 will open on the third Monday in February. Birmingham is the heavy industries branch, and includes by far the larger share of the electrical exhibits. The change, which we understand is purely experimental, has been made on the recommendation of the *ad hoc* Committee of representatives of the London and Birmingham Sections of the Fair set up by Colonel John Colville, M.P., Parliamentary Secretary to the D.O.T. Upon the result of this practical test may depend the future dates of all sections.

**Convention Prospects in 1935**

Many interesting thoughts will occur to our readers now that the decision is definitely known. Will the London Section become more attractive to electrical manufacturers in February as Birmingham will not require attention until later? We shall not be at all surprised if it does so, and without any detrimental effect upon the Birmingham show later. The desire for an electrical exhibition in London is frequently expressed. And will there be two electrical exhibitions in May or June—one at the Birmingham Fair and one at the usual I.M.E.A. Convention date? Further, as there are now reasonable grounds for believing that a National Electrical Convention will materialise in 1935 in place of three separate gatherings, will this be arranged somehow or other in conjunction with the end-of-May Fair at Birmingham? One point more at the moment: If May is the best month for receiving overseas buyers of electrical goods why is July found convenient for the I.E.E. to hold its very successful conversazione of its overseas members? Nineteen thirty-five certainly promises to be an interesting electrical year.

**Electricity for the Million**

From the point of view of the outside world the most interesting item on the agenda of the E.A.W. Conference which opens next Thursday (apart from the speeches at the annual luncheon) is the resolution to be moved at the general meeting that the time has now come when electricity should be available at an economic rate to the homes of the working people. No doubt the usual protests will be made by supply engineers with exemplary records that they do act in accordance with the spirit and the letter of this resolution; no doubt, also, the residue will lie low and say nothing. Lighting, the Building Centre, and Battersea power-station provide matters of technical interest, and the ball will, no doubt, once again prove to be a meeting-place for the "who's who" of the electrical world.



**The Corby Steel Works Scheme, Kettering.** (See page 515)

1. A steel tower and cradle guard. 2. Messrs. Stewarts & Lloyds main 11-kV control board. 3. Fitting insulators and clipping in conductors. 4. Constructing a G.P.O. cradle guard. 5. The 11,000-kVA, 33/11-kV transformers at Corby. 6. An angle tower partly completed, showing the vibration dampers. 7. General view of the Corby 33-kV outdoor sub-station. 8. The 33-kV control board with automatic mimic diagram of the outdoor sub-station and tap changer panel.

# Transformer Impedance. By D. W. McJannet

## The influence of the growth of systems on design

THE rapid development of electrical transmission and distribution schemes in recent years has caused engineers to face the fact that much of their old transformer plant is unsuitable for withstanding the mechanical strains imposed on it by present-day operating conditions owing to the maintenance of full voltage on short circuit.

The current flowing in the transformer windings under conditions of short circuit is inversely proportional to the impedance, and the forces exerted are approximately proportional to the square of the current. In the early days of transformer design it was usual to keep the reactance at a low value in order to obtain a good regulation at low power factors. This was an important aspect as the prevailing power factor was much lower than at the present time. To-day it is unusual to find the average power factor falling below 0.7, and consequently the question of bad regulation does not loom so large. Large power transformers in operation in various parts of the world have an impedance value as high as 12½ per cent. The largest units in Great Britain, operating at Barking, have an impedance of 9.82 per cent.

The percentage regulation of a transformer at any power factor is $(R \cos \theta)+(X \sin \theta)+\{(X \cos \theta - R \sin \theta)^2/200\}$ where R = percentage copper loss, X = percentage reactance.

For large transformers the percentage copper loss is small compared with the percentage reactance, and consequently the latter plays a large part in the regulation especially at power factors less than unity.

The table below shows the percentage regulation at various power factors of a transformer, the particulars of which are: 5,000 kVA, three-phase, 50 cycles, 22/6.6 kV; O.N. 50 deg. C. rise; copper loss at 75 deg. C. 36-kW; reactance 6 per cent.

| | |
|---|---|
| 1.0 p.f. = 0.9% | 0.6 p.f. = 5.28% |
| 0.9 p.f. = 3.39% | 0.5 p.f. = 5.59% |
| 0.8 p.f. = 4.27% | 0.4 p.f. = 5.80% |
| 0.7 p.f. = 4.85% | 0.3 p.f. = 5.95% |

Such regulation would be obtained only with transformers having a high ratio of reactance to resistance, and this is usual for large outputs. As even at 0.7 p.f. the regulation is less than 5 per cent., the effect of reactance upon regulation is relatively unimportant to-day.

### Short-circuit Effects

While the current flowing under short circuit is inversely proportional to the impedance, the fault current is a maximum only if the applied pressure is maintained at full voltage. In the majority of cases it is extremely doubtful if the plant capacity of twenty years ago was sufficient to maintain full voltage under short-circuit conditions. At present, due to the interconnection of many systems, and the advent of the grid, ample power is available, and many old transformers are now in a position on the system where full voltage would be maintained momentarily under short-circuit conditions.

The most onerous condition which the transformer itself has to withstand is a dead short-circuit across the secondary terminals. The current is maintained at a high value only so long as the primary supply is maintained, and the transformer is, therefore, unlikely to suffer any damage from overheating even when the so-called "doubling effect" is taken into consideration. This occurs when the short-circuit takes place at the instant when the voltage is passing through zero so that the flux is a maximum, and consequently the initial short-circuit current should also be a maximum. Actually the short-circuit current cannot instantly attain the value corresponding to the value of the flux wave, but must start from a value corresponding in sign and value to the full-load current.

During the cycle following short-circuit, the full voltage is generally active in producing abnormal short-circuit currents, and in order to maintain this pressure during the first half-cycle the short-circuit current must vary from a maximum value in one direction to a maximum in the opposite direction, that is, the total change is twice that occurring when a short-circuit takes place at maximum voltage and zero flux. This explains the doubling effect, but as a rule the short-circuit current does not reach the full double value on account of resistance drops.

As the forces on the winding vary as the square of the current, it will be appreciated that the effect of a dead short-circuit at the transformer terminals may have serious consequences, especially if it occurs at the instant of zero voltage when the doubling effect will come into play.

With a circular-core construction the forces in a radial direction (see fig. 1) tend to force the outer coils to a circular shape and to compress the inner winding, and consequently this type of construction is the soundest one to adopt for transformers in key positions on the transmission or distribution system, as the forces would have to exceed the elastic limit of copper before serious damage was done.

The mechanical forces between the primary and secondary windings in an axial direction are of more importance. (See figs. 2 and 3.) If the primary and secondary coils are of the same axial length and the electrical centres are coincident, repulsion forces normal to the coil surfaces only exist, but if the electrical centres do not coincide, a component is introduced at right angles to the force normal to the coil surfaces which tends to make the coils slide past one another. If the coil lengths differ, even though the centres are coincident, a similar right-angle component is introduced, which gives rise to effects of the same kind.

In the design of modern transformers the coils are of the same length and symmetrical about the same electrical centres, but, even so, it is difficult to preserve perfect symmetry at all ratios when tappings are provided. Even with a design giving practically perfect symmetry, it is quite possible after the transformer has been in service and shrinkage has been taken up by adjusting the coil supports that a slightly unsymmetrical arrangement will result.

Many transformers still in operation were built when little or no attention was paid to this aspect of design. The electrical centres of the windings were not widely different, but coils often varied in length. When one considers that on a normal, well-designed, modern transformer it is possible under short-circuit conditions to obtain pressure on the coil supports amounting to several tons, the effect of a dead short-circuit (possibly unsymmetrical) on the bracing of an old transformer can well be imagined.

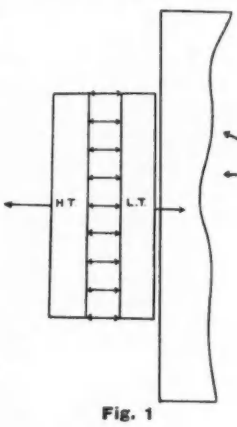


Fig. 1

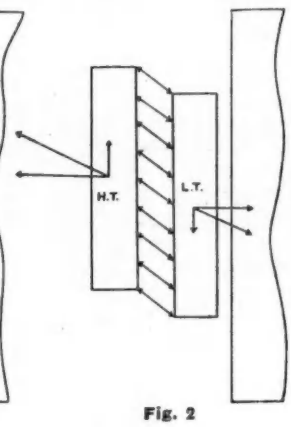


Fig. 2

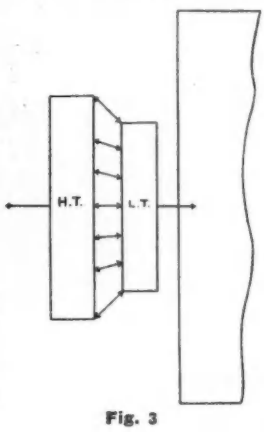


Fig. 3

### Limitations of Old Designs

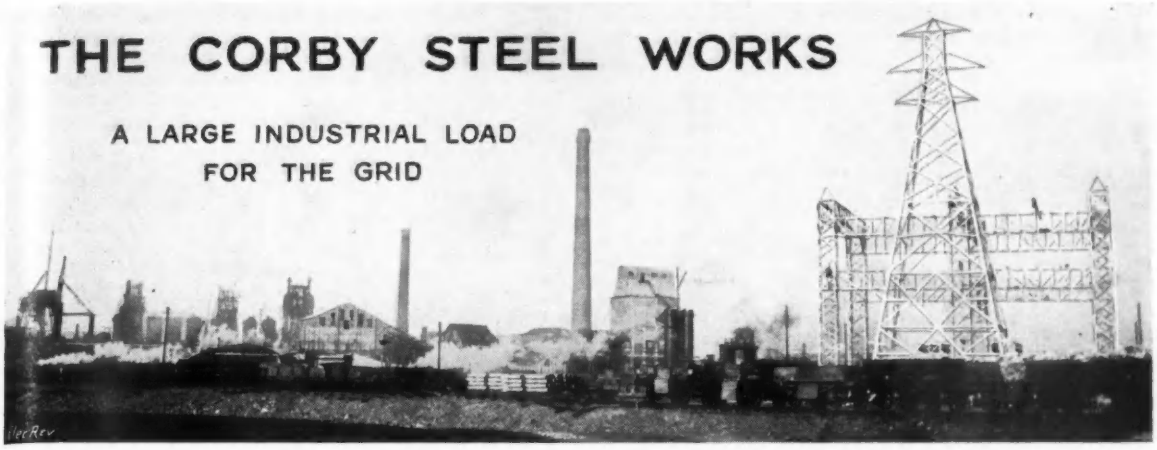
With an impedance of the order of 10 per cent. the current flowing will be ten times the normal, and the forces one hundred times the normal. A similar transformer with an impedance of 3 per cent. will have to withstand a short-circuit current of 33⅓ times full load with a force equal to $(33\frac{1}{3})^2$ times the normal.

Supposing, for example, the short-circuit in the latter case to occur at the instant of zero voltage, the short-circuit current becomes momentarily 66⅔ times full-load current, and the mechanical stresses over 4,000 times normal. It is therefore obvious that some old transformers at present in commission may be called upon under certain unfavourable circumstances to withstand mechanical stresses which were never even thought of when they were designed and with which they are totally unfit to cope.

The impedance of a transformer can be increased by the use of reactance coils, but a better solution of the problem would be the replacement of old transformers by units of modern design. The manufacturer would always be prepared to give details of the impedance of old transformers, and calculate values of forces under short-circuit conditions from which a decision could be made as to the suitability or otherwise of the transformer for its duties under conditions brought about by modern developments.

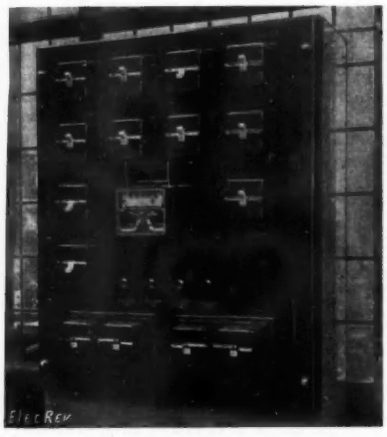
# THE CORBY STEEL WORKS

## A LARGE INDUSTRIAL LOAD FOR THE GRID



THE steel works of Messrs. Stewarts & Lloyds, Ltd., at Corby, Northants, is laid out as a complete entity for the conversion of iron ore mined in the vicinity into finished steel tubes. It is divided into the following sections, all of which are electrically operated: Ore excavation, coke ovens with coal washing and by-product plant, ore crushing, sintering, three blast furnaces, gas cleaning, ore bridge and scale and transfer cars, basic Bessemer plant, basic slag plant, blooming mill, skelp mill, and tube plant.

The largest power unit is the 7,000 h.p. synchronous motor with 0.9 leading power piston driving the generator that supplies the skelp mill, the latter comprising 2,500 h.p. (340 to 575 r.p.m.), 1,800 h.p. (190 to 360 r.p.m.), and four 650 h.p. (360 to 1,000 r.p.m), main d.c. motors. The blooming mill will be driven by a 4,500-20,000-h.p., 80 to 130-r.p.m., reversing d.c. motor supplied from an Ilgner set driven by a 3,000-h.p. induction motor with slip regulator.



H.p. auxiliary board fitted with "Bijou" circuit-breakers

A.c. motors are used as far as possible throughout the works. The smaller motors are wound for 400 V and the larger for 3,300 V, except the 7,000-h.p. machine, which is supplied at 11,000 V. Power is distributed by an 11,000-V ring main and transformed as near as is practicable to the points of utilisation.

### Very Large Consumption

It is anticipated that the annual consumption of electricity will be initially 35 million kWh and ultimately 75 million kWh with a demand of from 20,000 to 30,000 kVA. These requirements will be obtained from the Kettering U.D.C., and for this purpose the Central Electricity Board has constructed sixteen miles of double-circuit 33-kV line from the Northampton grid sub-station to a switching station at Kettering, from which a cable is run to the Council's power station to supplement the supply given from the Northampton Co.'s power station under a "temporary arrangement" made by the Board in 1929.

From this switching station the U.D.C. has continued the line for a further eight miles to Corby, where the supply is transformed at an outdoor sub-station to 11 kV for the steel works and for the Council's housing scheme and local supplies.

The conductors of this line are of 30/.102 aluminium with a 7/.102 galvanised steel core. The earth conductor, consisting of 12/.102 aluminium on 7/.102 steel, is electrically connected to each tower at which earth pipes are sunk (about four per mile) by a flexible connector introduced by Messrs. Arthur Ellis & Partners, and is strung so that the sag is parallel to the sag of the main conductors.

Steel towers and crossarms have been designed with clearances that will permit the raising of the voltage to 66 kV at a later date and are fitted with detachable links and straps at suspension points for an additional insulator unit. Stockbridge vibration dampers have been introduced in the main and earth conductors at each point of support. The sagging of the conductors is such that at 50 deg. F. the tension will not exceed 2,800 lb. Spans vary between 700 and 1,400 ft. Where the line passes over Messrs. Stewarts & Lloyds' property, the ground clearance is 37 ft. 6 in. to avoid risk of travelling excavators fouling the lines. Line insulation on the last five tension points before reaching Corby has been graded to suit the characteristics of the Ferranti surge absorbers through which the lines enter the outdoor sub-station.

### Transformers and Switchgear

The oil circuit-breakers, designed for 66 kV, are fitted with Deion-grid contacts and have a rupturing capacity of 500,000 kVA. Residual-voltage earth-leakage protection is employed for the transmission lines. The earthing system includes a wire across each of the three bays connected to an earth pipe.

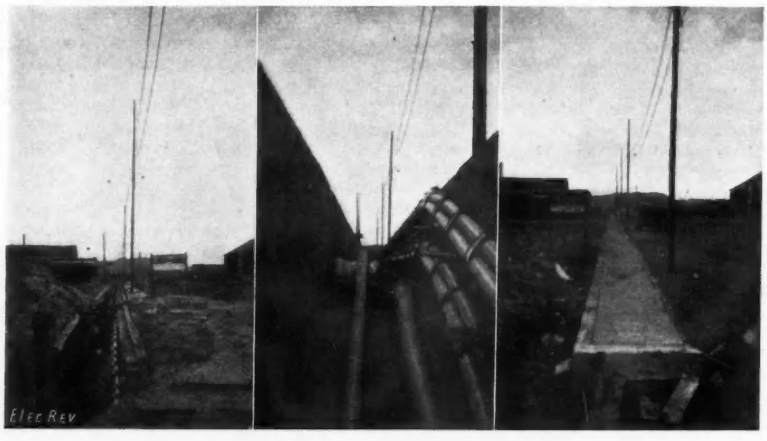
The two 11,000-kVA delta-star transformers are provided with Asea tap-changers with drop down tanks. Their 11-kV switchgear is housed in a building 340 yds. away, connection being through 0.5 sq. in. single-core p.i. l.c. cables laid in trefoil formation on racks in an open trench with concrete covers; there are no joints in these cables.

The 11-kV switchboard, which is of the Deion-grid metal-clad duplicate bus-bar type also includes two panels feeding the facing switchboard of Messrs. Stewarts & Lloyds, one panel for the Council's local supplies, bus section and coupler panels, and two oil-immersed isolators for a 15-kVA auxiliary transformer. The circuit-breakers are of 800 A, 250,000 kVA rupturing capacity.

The 33-kV panels for controlling the outdoor sub-station display a mimic diagram which automatically indicates the state of the switching. The on-load tap-changing panels indicate

The Kettering 11-kV board

the taps in use and any out-of-step conditions. Buchholz alarms for protecting the transformers are also installed in the sub-station.




**The main cable trench—open and closed views**

Metering equipments for the Central Board supply to the U.D.C., and for the U.D.C. supply to the steel works, include in each case kWh meters with summating attachments for actuating the summators and the m.d. printometers. Check meters are connected permanently in circuit but are not normally connected to the summators. The cost of the scheme to the Urban District Council was approximately £45,000 and the principal contractors were: W. T. Henley's Telegraph Works Co., Ltd. (transmission between Kettering and Corby and cable duct) with towers by Milliken Bros., Ltd., and insulators by Steatite & Porcelain Products, Ltd.; English Electric Co., Ltd. (Corby outdoor sub-station, 33-kV switchgear and the 11-kV switchgear for both the U.D.C. and Stewarts & Lloyds in the indoor sub-station, and low-voltage switchboard equipped with Nalder "Bijou" circuit-breakers); Brush Electrical Engineering Co., Ltd. (two 11,000-kVA transformers and auxiliary transformer); Ferranti, Ltd. (metering).

Messrs. Highfield & Roger Smith, consultants to the Central Board for the Central England Area, designed the transmission system between Northampton and Kettering, and Messrs. Arthur Ellis & Partners the entire scheme for the U.D.C. Messrs. Ellis, who had previously advised the Council regarding the agreement of 1929 with the Central Board, were also responsible in conjunction with Mr. W. A. Walker, the Council's electrical engineer, on behalf of Kettering U.D.C., for the negotiations with Messrs. Stewarts & Lloyds, the electrical engineer for whom is Mr. W. B. Green. The construction of the line occupied only twenty-two weeks from the date of acceptance of the tender.

## The Inauguration Ceremony

The supply was officially inaugurated on April 10th, when Councillor J. Haynes (chairman, Kettering Electricity Committee) switched on the current at the entrance to the steelworks offices, after which Councillor Mrs. C. W. Clarke started up two 200-h.p., 3,000-V motors operating the ore-crushers.

At the luncheon which followed Sir Andrew Duncan (chairman, C.E.B.) briefly proposed "The Kettering U.D.C. and its Electricity Undertaking," commending the progressive policy which the Council had adopted. The response was by Councillor H. Hodge (chairman, Kettering U.D.C.), who presided.

Sir John Brooke (vice-chairman, Electricity Commissioners), in proposing "The Electrical Industry," referred to the gratifying increase in the national output last month (to which we refer elsewhere) and Mr. P. J. Robinson (pres., I.M.E.A.) responded.

Councillor Haynes, in proposing "The Consumers," stated that 90 per cent. of the working-class houses were connected to the Kettering mains. In responding, Mr. A. C. MacDiarmid (chairman, Stewarts & Lloyds, Ltd.) said he believed that there were no other steelworks in the world of the same nature as those at Corby. His company had originally intended to generate its own electricity, but realising the benefits of the grid it had altered its plans.

Councillor C. W. Clarke, in toasting "Our Guests," spoke of the pleasant manner in which negotiations with the C.E.B. had been carried out; Sir Arthur de Capell Brooke, Bt. (chairman, Northants C.C.) and Sir Duncan Watson (C.E.B.) responded. In replying to the toast of "The Engineers," which had been given by Councillor H. J. Potter, Mr. Arthur Ellis claimed that every regard had been paid to ensuring reliability of supply in this instance. He paid a tribute to the assistance given by Mr. W. A. Walker (electrical engineer, Kettering U.D.C.) in securing wayleaves, and to the work of Mr. Francis Ellis, who had supervised the scheme. Mr. W. F. Bishop (director and general manager, W. T. Henley's Telegraph Works Co., Ltd.) replied on behalf of "The Contra tors," to whose work Councillor H. Martin had appreciatively referred.

Others present in addition to the speakers and those mentioned by them included Sir Archibald Page (general manager, C.E.B.), Messrs. Harold Hobson (commercial manager, C.E.B.), S. T. Allen (manager, Central England Area, C.E.B.), C. B. Tutt, C. Binns, H. Kilsby and R. J. Carter (Kettering U.D.C. electrical staff), J. H. Colyer, H. Dowsett, Ward and Maylett (W. T. Henley's Telegraph Works Co., Ltd.), V. Z. de Ferranti and C. W. Bridgen (Ferranti, Ltd.), J. Miles, T. P. Colclough and M. Mackenzie (H. A. Brassatt & Co., Ltd., consulting engineers to Stewarts & Lloyds), two representatives of the Brush Electrical Engineering Co., Ltd., G. H. Nelson and W. Graham (English Electric Co., Ltd.).

# Further Columbia River Development

On June 23rd last we described the work in progress on the Hoover Dam, the 250,000-kW scheme at Colorado River. The U.S.A. Army Engineers have now reported in favour of a project involving the construction of ten dams with turbines aggregating 8,000,000 kW, thus adding over 20 per cent. to the existing generating capacity, giving an output of 41,000,000,000 kWh, the equivalent of half the present output. The total cost of the development is given at $961,000,000 in addition to expenditure on irrigation.

Work is being started on two dams at Grand Coulee and Bonneville. Grand Coulee, sixty miles from Spokane, Wash., is designed for an ultimate capacity of 1,500,000 kW and an output of 7,000,000,000 kWh per annum. Expenditure on construction includes $171,000,000 for the dam and power house, $9,000,000 for the formation of an artificial lake, and $200,000,000 for water distribution. The total of $394,000,000 exceeds by $20,000,000 the cost of building the Panama Canal. The annual output will be about double that obtainable from the Hoover Dam.

The Grand Coulee Dam will be 450 ft. high measured from the foundations, which go down 60 ft., and will contain eleven million cu. yd. of concrete (three times the amount required for Hoover Dam). It will create a lake of 120 sq. miles, which will provide 5,000,000 acre ft. of storage.

Some 800,000 kW will be available for power purposes after allowing for the plant used for irrigation. The power house is to be of steel and concrete measuring 1,028 by 73 ft. The generator room will be just above maximum recorded tail water.

Each of the fifteen 105,000-kW generators will be driven by a reaction turbine running at 120 r.p.m., and will form a unit with a 22/220-kV transformer bank supplying one feeder. Five generators will, in addition, have switchgear for supplying the twenty pumps for irrigation. There will also be two auxiliary generators. L.v. switchgear will be housed in the substructure. The initial installation is to consist of three generators; it is anticipated that the ultimate capacity will be required by 1940.

The pumps will be designed to work against a head of 370 ft. and to be direct connected to 22-kV, 33,000-h.p., 200-r.p.m. synchronous motors. The cost per kWh, inclusive of capital charges, is expected to be 0.075d. at the switchboard and the revenue to average 0.1125d. The economical limits of power transmission in area within a 300-mile radius of Grand Coulee is now about 4,000,000,000 kWh; by 1960 it is anticipated it will have increased by 1,000 per cent.

The Bonneville scheme provides for the initial installation of 90,000 kW in two sets with an ultimate capacity of 540,000 kW and an output of 1,500,000,000 kWh. The total expenditure is estimated at $31,000,000, which includes the construction of a dam 72 ft. above water level. Nearby industries will be supplied at 22 kV, the generator voltage. The cost of electricity at the bus-bars is again estimated at 0.075d. per kWh.

# Two-power Shunting Locomotives. By R. Hedley

## An advantageous Diesel-battery system

THE separation of shunting from train haulage has led to substantial economies and to a speeding up of the services, especially over short distances. The storage-battery locomotive is now in successful use in the shunting yards of steam-operated railways all over the world, but recently the internal combustion engine has become a serious rival of the electric motor for light shunting duties.

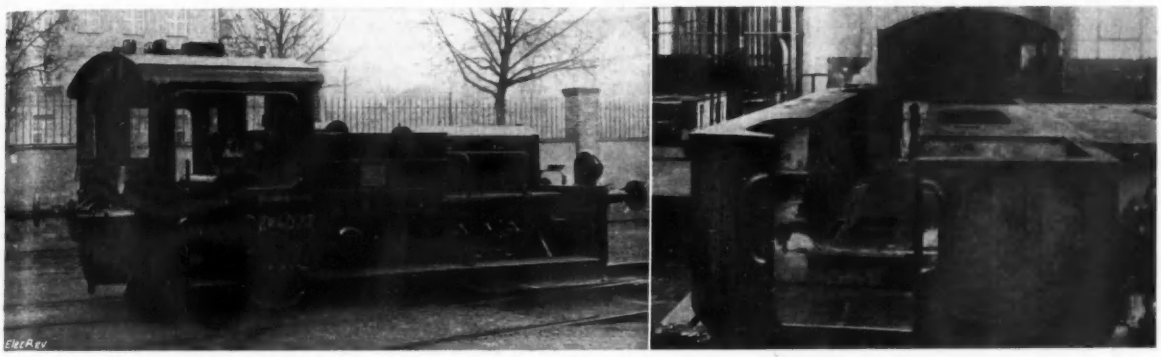
A new development is to combine the two systems in a "two-power" locomotive, the motive power for which is derived from a petrol or heavy-oil engine, directly coupled to a standard d.c. generator (which also motors the engine at starting) permanently connected in parallel with a battery. Current in excess of that taken by the traction motors at any moment is diverted into the battery, which is thus kept fully charged, while overcharging is prevented by an automatic overload relay.

The system described in these notes is that adopted for the two-power locomotives built by the Siemens-Schuckertwerke to the order of the German State Railways. Current is normally supplied to the two traction motors by the generator alone; additional energy required (*e.g.*, during acceleration or on heavy gradients) is drawn from the battery. Alternatively, or if the engine generating set breaks down, the traction motors may be driven entirely from the battery, thus considerably enhancing reliability as compared with the usual combination. The prime mover works continuously at full load and therefore at its highest efficiency.

The capacity of the engine-generator set needs to be adequate only to the *mean* tractive effort, which experience obtained in shunting work shows to be from one-tenth to one-fifth of the maximum torque exerted at the rim of the driving wheels, and the capacity of the battery is only about one-third of that required for an ordinary accumulator locomotive, with a corresponding reduction in both the energy loss and the maintenance cost.

One considerable advantage of the two-power locomotive lies in its complete independence of any stationary charging plant. This feature enables one unit to be employed at a number of intermediate stations in advance of a goods train, thus relieving the steam locomotive of the latter of shunting duties and avoiding much incidental mileage.

The locomotive illustrated has a weight of 16 tons, complete in working order. The power plant consists of a 23-b.h.p., 800-r.p.m. petrol engine, directly coupled to a 13-kW d.c. generator. The battery, supplied by the Accumulatoren Fabrik A.G., has 92 cells with a capacity of 72-Ah at the one-hour discharge rate. Two 24.5 kW (one-hour rating), 220-V traction motors, are rigidly mounted on the chassis frame and drive a common layshaft by spur-wheel reduction gears.



**A general view of the Diesel-battery shunting locomotive, and (right) showing the vehicle with the roof removed**

The final power transmission to the two locomotive axles is by a pair of roller chains which take also the place of the customary coupling rods, thus making the whole weight of the locomotive available for adhesion. Speed regulation of the traction motors is by means of an ordinary drum type controller, as used in an accumulator locomotive.

Arc welding is extensively used for building up the component parts of the chassis frame which is made of mild steel plates 1 in. thick. This method gives greater mechanical strength and rigidity than is obtainable by riveting, and in addition, simplifies the design of the whole structure so that the machinery is readily accessible from above. The low footplate, another departure from orthodox locomotive design, enables the driver to descend easily and to assist in the coupling or uncoupling of trucks, thus reducing the number of shunters required. The draw hooks fitted at each end of the locomotive can be operated from the cab, thus expediting shunting operations. The controls may be worked from either side of the driver's cab.

Satisfaction with the results obtained with this type of light shunting locomotive has induced the German State Railways to place an order for a more powerful vehicle weighing about 50 tons and fitted with a heavy-oil engine.

# Hardening Instrument Pivots. By W. H. Lawes, B.Sc.

THE hardening process described below was devised by me about twelve years ago to overcome the difficulty occasioned by variation in the quality of instrument pivots. The method is, of course, suitable for similar small steel parts, and may be carried out by unskilled labour.

The main difficulties encountered in hardening pivots are (*a*) the ensuring of the correct quenching temperature, (*b*) the prevention of oxidation during heating, and (*c*) the preservation of the hardness during the grinding and finishing operations.

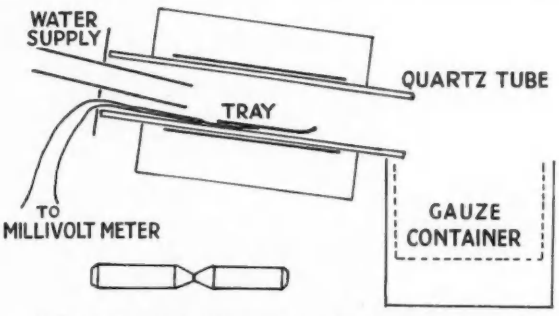
A special furnace of simple construction is made from a quartz tube 6 in. long and about ½ in. inside and ⅝ in. outside diameter. The tube is wound for about 4 in. of its length with a single layer of nichrome or similar wire, to have a loading of about 300 W at full voltage. Means for regulating the temperature from 700 to 800 deg. C. is provided, and a rheostat or choke in series with the winding will afford simple control. A tray of thin sheet nichrome or iron about 1 in. long is made to fit the bore of the tube easily, and to this tray is welded a thermo-couple of small section. A sensitive milli-voltmeter is provided suitable for reading up to a thermo-couple e.m.f. equivalent to 800 deg. C. or over. A temperature indicator may be used, but is not essential.

The leads from the thermo-couple are brought out at the upper end of the tube for convenience, and near this end an adjustable pipe of, say, ¼-in. bore, connected to a water supply, is arranged so that a good flush of water may be made to play suddenly on the contents of the tray. It is an advantage to fit the pipe with a 1-in. diameter collar by which the upper end of the furnace may be closed to prevent free circulation of air and thus minimise oxidation. The steel wire is cut up in the usual way into lengths a little over double that of the finished pivots, and a 120-deg. V-groove is formed in the centre of the lengths.

### The Method of Operation

To operate the furnace the current is switched on, and when the tube is at a red heat a few of the double lengths of steel are placed in the tray, which is then pushed to the middle of the tube. The current is regulated and the indication of the millivoltmeter is watched until the furnace is judged to have reached hardening temperature. The indication is noted, and the temperature is kept constant for a minute or two while the pieces "soak." The water is then suddenly turned on, thus quenching the pivots and washing them into the gauze container.

The lengths are tested for hardness by breaking them at the V groove, and more pieces are heated and quenched at a higher or lower temperature until the steel is found to be just hard.




**A simple furnace arrangement. (Inset: A pivot blank)**

A somewhat higher temperature (1½ per cent. on the millivoltmeter) is used for production, in order to provide a margin of safety.

This empirical method of ascertaining the correct hardening temperature will be found useful because different batches of steel will not have quite the same carbon content and therefore the critical temperature will vary. The result of the process so far is to produce lengths of steel hardened with a close texture, while the second requirement is met to a considerable extent by the rapid heating in the nearly closed tube. It will be appreciated also that the pointed end of the pivot is entirely protected from oxidation.

For the important operation of grinding the lengths are broken in two, ground, and burnished. Grinding is usually carried out in two stages, using coarse and fine wheels, and in all the operations to satisfy the third requirement it is very important not to heat the steel above, say, 130 deg. C. To this end it is absolutely essential that the abrasive wheels should never grind a dry pivot. Therefore either the wheels should run in a cooling liquid or a copious supply of the liquid should be directed on to the piece throughout the period of grinding.

The quartz tube gradually deteriorates, due to heating and cooling, and a spare should be available. If a hundred or so amperes are available at a low voltage the quartz might well be replaced by a nichrome tube, the current being led in at one end and out at the other. The initial cost of the apparatus is a few pounds only and its use will definitely ensure the production of uniformly hard pivots.

# Coal-face Lighting. By W. Davies

## Suggestions for improvement

THE payment of compensation claims due to nystagmus is an appreciable item in the costs of coal production and poor lighting is an important contributory factor (though not the only one) to the existence of the disease. For direct-face lighting various voltages from 12 to 220 have been suggested, but I consider that for safety the figure should not exceed 25-V, at which it should be standardised. At 25-V the lamp would stand rougher usage, but against this lower voltage is the fact that the thicker filament would cool more slowly if the bulb broke and would therefore be more likely to ignite gas. I have calculated that the best conditions for avoiding glare would be obtained by the use of 18-W lamps 30 ft. apart.

As the cable must be pliable as well as mechanically strong, twin armoured cable is not so suitable as tough-rubber cable; but no cable yet available, so far as I am aware, has all the requisite qualities for the coal face, since tough rubber cable is too liable to mechanical injury.

The only fitting giving reliable service for the duty is the plug type with bayonet contacts. The cable entering the plug is "made-off," glanded and clamped to avoid any risk of its being pulled out. A loose-threaded ring over the mechanical parts of the end can be screwed to the fitting after the plug has been connected, thus preventing the withdrawal of the latter. The mechanical connection is partly completed before the electrical connection has been made, reducing the risk of "open sparking." There are several good makes of such plugs on the market which obviate the need to open the main switch each time a disconnection is made. A suitable arrangement is to have three plugs on a common base for the lighting fitting and the incoming and outgoing cables. This enables the fitting to be moved to a new position with the minimum of disturbance in the supply to other lamps on the circuit. Oval prismatic glass is by far the most suitable protection for the lamp. The best reflector (whether steel-mirror, matt, or enamel) is a matter for experiment according to position.

**Mr. W. Davies is an associate member of the Association of Mining Electrical Engineers**

Direct lighting has many disadvantages. The fittings must be fixed on the timber nearest the coal face; otherwise the intervening timber will obstruct the light, but the nearer to the face they are the smaller is the area illuminated. As 30 ft. between fittings is the desirable distance every fitting must illuminate 15 ft. on each side of it. It is doubtful whether the fittings could be installed far enough from the face to do this without the light intended for the coal face being obstructed by timber. The illumination behind the fitting is of the greatest importance as in that area falls of roof are more likely than nearer the coal face. To obtain adequate intensity behind the fitting the use of the well-glass type would be necessary (instead of the prismatic) and this is far too fragile for coal-face working.

Certain cap lamps have been passed by the Mines Department for use in fiery mines, but a lead between the battery and lamp is a weak link having regard to the possibility of explosions, even though official tests have shown that the fusing of the lead would not ignite gas in certain proportions. But however severe the laboratory test may be the conditions in the mine may be different. The carrying of a battery on the back when lifting trams on to the road and such like heavy jobs which have frequently to be performed is a nuisance. There is also the risk of spilt acid injuring the miner's back when lead cells are used.

Alkaline cells are, in my opinion, much to be preferred for many reasons, among which is the greater candlepower available for a given weight of hand-lamp. The lead-acid 2-V cell with container weighs from 6½ to 7½ lb.; doubling the voltage almost doubles the weight. The 4-V alkaline cell weighs from 10 to 11 lb. and inquiries among miners using this type of lamp reveal that they do not object to carrying the additional weight on account of the great improvement in illumination.

A good method of lighting was described in a recent report of the Mines Department. At Worksop Main Colliery a conveyor face 480 ft. long is lighted by 6-V 6-c.p. safety lamps. The height of the face is 6 ft. and the lamps are hung 4 ft. 9 in. above the floor and spaced 30 ft. apart along the face immediately over the conveyor belt. The face is supported entirely by steel props, all whitewashed. It is possible to see from one end of the face to the other, and the inspector responsible for issuing the report considers that lighting of this standard is bound to reduce the number of accidents and to result in cleaner coal and working economies. The use of whitewash has been found to improve the reflecting surface from 70 to 80 deg.; and of stone dust by from 40 to 45 deg.

Improvements in coal face lighting lie in an increased candlepower in the miner's portable lamp, as he requires light at whatever point he happens to be working, and it is impracticable to light by means of fixed fittings every spot to which he may have to turn. The provision of safe and effective direct lighting is so fraught with difficulties that I see little hope for the system for many years. I would suggest that the Miner's Welfare Committee could not do better than set aside a sum of say £20,000—a small proportion of its huge reserve funds—as an inducement to manufacturers to develop a direct lighting system for the coal face that would comply with every requirement. Those of us who know how much agony is suffered by the unfortunate miner who contracts nystagmus, and what is the cost to the industry for compensating these unfortunate men, feel that miners' welfare money spent in such a practical way as this would justify the name of the Fund.

# Brimsdown "B"

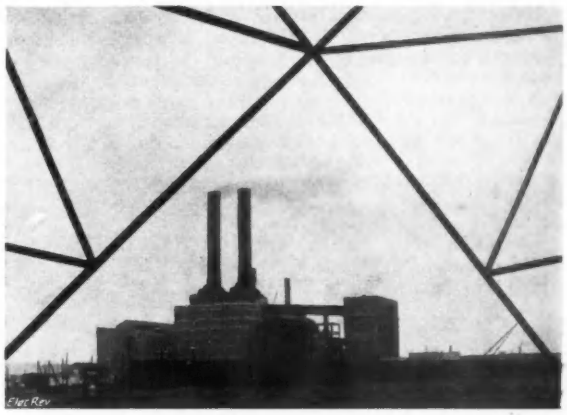
## Technical features of the 50,000-kW extension

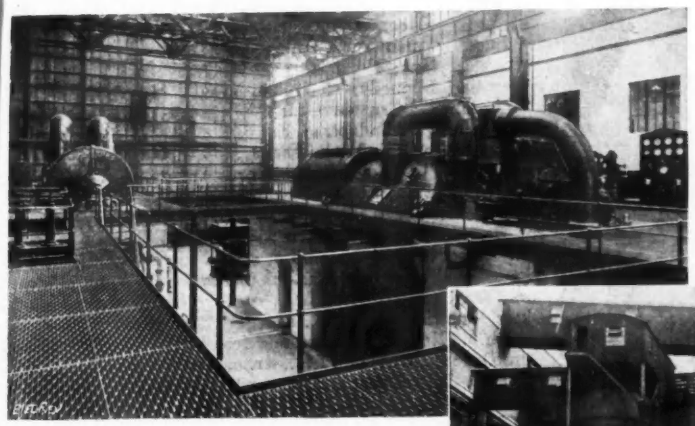
THE most recent plant in Brimsdown "B" station of the North Metropolitan Electric Power Supply Co. was put into commission in 1932, though it has not previously been described in the technical Press, and since then several novel features have been introduced. The aggregate generating capacity of the Northmet Co. is now close on 170,000 kW with which to meet a system demand of 140,000 kW, a figure that has been nearly doubled within the past five years. The additional 50,000 kW (equivalent to two years' growth of load at the present rate of increase) brings the total capacity of the Brimsdown "B" station to 100,000 kW, the original section comprising two 25,000-kW turbo-alternators and five 120,000-lb. per hr. boilers.

The four new boilers have a maximum rating of 200,000 lb. per hr. each, based on coal containing 17 per cent. of ash and 18 per cent. of moisture and having a c.v. of 10,500 B.th.u. per lb., although the coal used contains no more than 10 per cent. of ash with a c.v. of 12,000 B.th.u. per lb. The unit system of pulverised-fuel firing has been adopted instead of the central system employed with the older boilers.

The new boiler house—a steel-framed building with brick filling—is at right angles to the extension of the turbine house and has a central firing aisle, over which are the four 250-ton bunkers, which are fed by a single 120-ton per hr. belt conveyor. Coal is delivered either from the L.N.E.R. or by barge from the River Lea and is distributed by the agency of two fireless locomotives.

The pulverising plant is in duplicate for each boiler; each unit maintains half output and is fed by its own outlet from the bunkers *via* an Avery 5-cwt. weigher with brass-lined inlet hopper and stainless steel cut-off door, and thence into





The 25,000-kW turbo-alternator

5-ton hoppers. The hoppers discharge by gravity to the mill feeders on the exhauster floor below. The revolving-table feeders are belt-driven by 2-h.p., 400-1,200-r.p.m. d.c. motors.

Each Raymond-Lopulco mill has a normal capacity of 6.3 tons per hr.; air for drying is received from the air heaters at from 500 to 600 deg. F. The mill is driven by a 110-h.p., 400-485-r.p.m. s.r. motor. The exhauster fan, which is driven by a 105-h.p., 1,160-1,440-r.p.m. s.r. motor, deals with nearly 9,000 cu. ft. per min. of air-coal mixture. Normally the primary air is 14½ per cent. of that required for combustion.

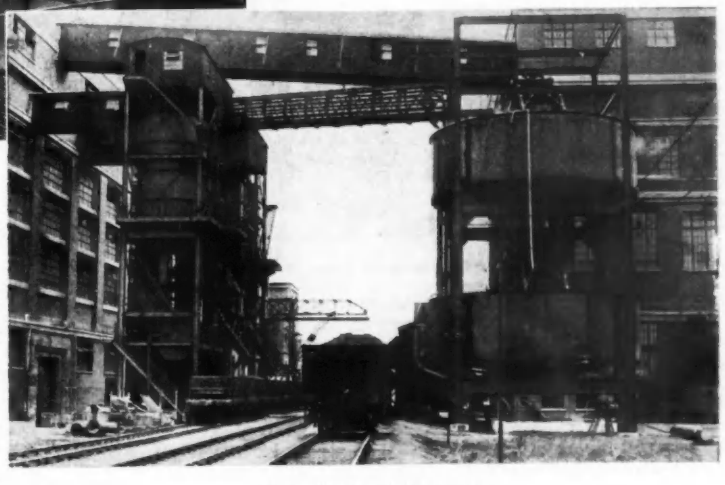
The air-coal mixture is divided into two streams in a distributor box, whence it goes to the burners, two of which are situated in each of the diagonally opposite corners of the combustion chamber.

Except for the feeder and separator motor switches, all controls, instruments, &c., are on the main boiler control panels.

The Wood radiant-heat boilers are essentially water-cooled combustion chambers with integral economisers behind their back walls. In the Brimsdown boilers increased turbulence and combustion with a minimum of excess air has been achieved by arranging the burners 5 ft. above the water screen. The burners (and also the secondary air admitted above and below them) fire tangentially at an imaginary circle with a diameter of 3 ft. 6 in. at the centre of the combustion chamber. This arrangement also results in a scrubbing action between the gases and the wall tubes, thus improving heat transmission. A Kermodes oil lighting-up equipment of sufficient capacity to raise full pressure is provided for each boiler.

The superheater (Superheater Co.) has a total surface of 5,100 sq. ft. and raises the steam temperature to a maximum of 820 deg. F. The two Howden-Ljüngstrom air heaters (located on the fan floor) normally reduce the flue-gas temperature to 250 deg. F., and raise the combustion-air temperature to 575 deg. F. Feed-water is supplied to each boiler normally through a Cope's pressure regulating valve in series with two tension-type regulators in parallel. The turbo-vane forced-draught fans are direct-coupled to 65-h.p., 1,440-r.p.m. s.c. motors switched direct on to the line. The turbo-vane induced-draught fans are each capable of dealing with a gas quantity equivalent to 75 per cent. of normal load. They are driven by two-speed s.c. motors with ratings of 65 and 150 h.p. at 720 and 960 r.p.m. At the lower speed switching is direct; at the higher, auto-transformer starting is employed. Both f.d. and i.d. fans are controlled by Hagen pneumatic equipment.

The "Usco" flue-gas washing plant has been modified since its installation. One chamber is provided for each boiler, the gases entering at each side from the two i.d. fans and returning through rectangular wooden baffles in T formation in the centre. The heads of the baffles, which project into the wash-water tank, are provided with wooden weir boxes to distribute the water down each baffle. This arrangement permits the use of the (slightly alkaline) slurry as the washing medium. The gases freed from grit (which sticks to the baffles) pass to the 250-ft. concrete-lined



Ash plant and thickeners

chimneys, of which there is one for each pair of boilers. The slurry from the chamber flows to a small tank and is returned to the baffle tank by a rubber-lined pump. Undue concentration of wash water is prevented by bleeding off a proportion from the pump suction and delivering it to two Hardinge thickeners, whence the slurry is periodically discharged to two Rovac fitters and ultimately to the ash removal plant. Single-stage Barronia-metal pumps have solved the difficulties experienced with c.i. pumps in returning water from the thickening plant to the washing chambers. The ash handling plant is of the Davidson pneumatic type and the capacity of each of the storage hoppers is 75 tons.

The two 25,000-kW, 3,000-r.p.m. turbo-alternators are arranged longitudinally in echelon. Steam conditions are 315 lb. per sq. in. and 750 to 800 deg. F. One turbine, a two-

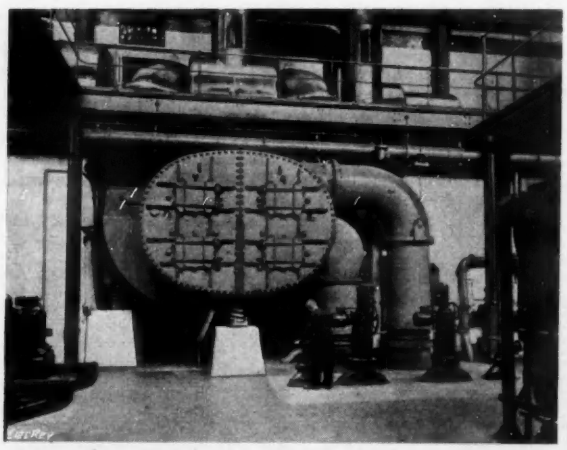
cylinder impulse-reaction B.T.-H. machine with double-flow l.p. cylinder, drives the 11-kV Parsons alternator which was displaced by the pioneer 33-kV unit. The condensers are of twin annular-flow design in which the first pass on the water side is lyre shaped.

One l.p. and one h.p. bled steam heaters of the vertical hair-pin type raise the condensation to a temperature of 270 deg. F.

Circulating-water pump house; new pumps in foreground

The control room, showing panel heating

at maximum load. The second turbine is a Parsons reaction two-cylinder machine with a double flow l.p. cylinder and drives a 33-kV alternator similar to the older 33-kV machine, which is coupled to No. 2 turbine, in the first section, but it has a slightly larger frame and is equipped with wooden end shields to reduce stray end losses. The h.p. blading is of the



The inverted-type condenser

end tightened type and the last two rows of the l.p. spindle blading are provided with alloy steel carbon shields.

The single inverted-type condenser is similar to the lower half of a central-flow condenser, the top section of the tubes being replaced by a baffle. The two motor and two steam feed pumps have individual capacities of 315,000 lb. of water per hr. against a discharge pressure of 510 lb. per sq. in.; at no load is the pressure less than 600 lb. per sq. in. The Weir steam pumps start up automatically should the supply fail. Condensing water obtainable from the Lee Navigation is sufficient for a load of only about 50,000 kW, and three film concrete shell towers have been built with individual capacities of 1,400,000 gal. per hr. (the requirements of one turbine). The make up, which is less than one per cent., is supplied from deep wells.

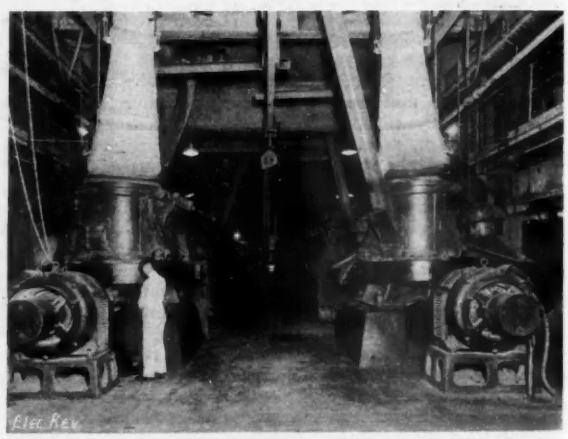
The three new vertical-spindle c.w. Mather & Platt pumps will deliver 23,000 gal. per min. against a total head of 65 ft. at a speed of 580 r.p.m. Works power is derived from the 11-kV house sets in Brimsdown "A" and stepped down to 415 V by 500-kVA outdoor transformers. Motor control is in almost all cases by air-break automatic contactors.

Main switching is performed at 33 kV. The new gear is of the B.T.-H. oil-filled metal-clad drop-down type and is situated out of doors. The busbars are in duplicate and each unit is provided with two 800-A 1,000,000-kVA circuit-breakers, remote electrically operated by a centrifugal mechanism from the control room.

Various modifications have recently been made in the two sections of the station. The two Sturtevant electrostatic precipitators installed towards the end of last year were the first of their kind in this country for dealing with flue gases from p.f. boilers. They operate at 40 kV and give an efficiency of 91 per cent. at normal boiler rating. There are a number of other items new to British practice.

The extensions were designed throughout by Captain J. M. Donaldson, chief engineer, Northmet Co., and his staff.

The principal contractors and sub-contractors, apart from those already mentioned, were: International Combustion, Ltd., boiler plant; Nortons Tividale, Ltd., boiler-house steelwork; Allan Kennedy, steel flooring; Edwin Danks & Co., Ltd., chimneys; Trussed Concrete Steel Co., Ltd., concrete lining; Mining & Industrial Equipment, Ltd., milling plant and flue dust washing equipment; Drayton Regulator & Instrument Co., Ltd., desuperheaters; Diamond Sootblower Co., Ltd., soot blowers; James Howden & Co., Ltd., f.d. and i.d. fans; Dewrance & Co., boiler mountings and valves; Geo. Kent, Ltd., steam-flow meters; Electroflo Meters Co., Ltd., $CO_2$ meters; Negretti & Zambra, draught gauges, temperature indicators and recorders; Radiovisor Parent, Ltd., smoke indicators; Mavor & Coulson, Ltd., coal conveyor; Metropolitan-Vickers Electrical Co., Ltd., s.c. motors and control gear for over 55h.p., No. 3 condenser and feed-heating systems; Lancashire Dynamo & Crypto, Ltd., s.r. motors; Brookhirst Switchgear, Ltd., control gear for motors below 55h.p.; Hopkinsons,



Pulverising mills

Ltd., superheater blowdown valves; Wm. Wadsworth & Sons, Ltd., lift; Vickers-Armstrongs, Ltd., evaporating plant; Mather & Platt, electric feed pumps; J. Blakeborough & Sons, Ltd., c.w. and l.p., f.w. valves; English Electric Co., Ltd., control gear for water pumps; Film Cooling Towers (1925), Ltd., cooling towers; Staveley Coal & Iron Co., Ltd., circulating water pipes; L. J. Speight, Ltd., laying and jointing; B. French, Ltd., auxiliary cable work; A. Reyrolle & Co., Ltd., sub-station switchgear; British Thomson-Houston Co., Ltd., main 33,000-V switchgear.

# D.C. to A.C. Change-overs. By R. H. Cobbold, A.M.I.E.E.

## The effect on exemptions under the Home Office Regulations

In sanctioning a scheme for the conversion of a distribution system from direct to alternating current, it is now the practice of the Electricity Commissioners to direct attention to the fact that premises subject to the Electricity Regulations made under the Factory and Workshops Acts will, after the conversion, no longer enjoy the advantages allowed by Exemption 1 from those Regulations. This exemption removes from the requirements of some two-thirds of the Regulations those d.c. systems or installations in which the pressure does not exceed 250 V, including "low-voltage" (less than 250 V) circuits connected to each side of a three-wire system, between the outers of which there is medium pressure, provided such circuits are kept distinct and apart from one another. For a.c. systems this exemption does not apply if the pressure exceeds 125 V.

An undertaking in effecting a conversion to a.c. becomes morally, and probably legally, responsible for making any necessary modifications to those of its consumers' installations which are covered by the Regulations. Medium-pressure (250 to 650 V) systems do not come under Exemption 1 and an undertaking would incur no responsibility for inspecting or, if necessary, modifying circuits working at such pressures. The following remarks apply only to l.v. circuits.

Conduit and metal sheathing, switch and fuse boxes, motor frames and all other metal which might become alive must be earthed adequately and efficiently; slip conduit will require bonding at each junction (Regs. 3 & 21).

The screw caps of high power lamps, which may be alive, will require protection by suitable shrouds (Reg. 2); metal shades, reflectors and galleries must be earthed or insulated so as to avoid the possibility of their becoming alive (Reg. 21). A fatal accident is recorded due to neglect of this precaution; a tall movable metal structure which was being pushed across a factory floor came into contact with a metal lamp reflector which had become live owing to frayed insulation on a wire but which being unearthed had given no previous evidence of the fault.

Mr. R. H. Cobbold

### Switches and Fuseboards

Attention must also be given to switches, fused switches and fuseboards (Reg. 3). Clearances must be adequate to avoid arcing between poles or to the case or the risk of an arc burning the hand of the operator; this generally excludes the use of switches with handles working in slotted covers. The covers of switches and fused switches must be interlocked with the operating handles if live metal is exposed on removal of the cover. It must be impossible to touch inadvertently any metal which may be exposed whilst alive; old-type switches will often be found to infringe this requirement and special attention should be given to fuseboards, older kinds of which usually have the busbars on the front of the insulating base and are therefore liable to be touched whilst alive.

The expense of replacing the board can often be avoided by covering the busbars with a screen cut from a sheet of fireproof insulating material. Alternatively, for large installations, use can be made of Regulation 15 which permits switchboards which have live metal exposed provided they are suitably fenced or enclosed and made accessible only to authorised persons. Motors must be equipped with suitably placed switches by which pressure can be cut off from all apparatus including starters (Reg. 11).

Regulation 5 which deals with the construction of fuse-gear is not subject to Exemption 1 and therefore applies to all installations irrespective of voltage. It requires fuses to be of adequate rupturing capacity and so constructed as to avoid danger to any person from arcing or the scattering of hot metal and from contact with live metal when handling the carrier or renewing the element. Many fuseboards of old design incorporate fuses which do not satisfy this regulation, but there is no obligation on an undertaking to replace them, though the attention of the owner should be directed to their defects. Fuse carriers in which the wire lies in an open groove along the front or runs through an axial hole having an observation window in front are common, as are various types which permit the wire or contacts to be touched during insertion or withdrawal.

Regulation 9 is subject to Exemption 1 and requires all single-pole switches to be placed in the "live" conductor; those in premises covered by the Regulations must be tested for correct connection. Time and trouble can be saved by the use of such an instrument as the "Electroscope," made by a Copenhagen firm, which is obtainable in this country. The body of this instrument, which has a length of 6 in. and a diameter of ¼ in., is made of insulating material and has at one end a metal point and at the other a metal cap with a "window" in the end; when the point of the instrument is applied to any live metal (above about 100 V, a.c. or d.c.), the metal cap being held between the fingers, a small flag appears behind the window. The incorporation of a high resistance prevents shock should the internal insulation fail. The correct operation of the instrument should first be verified by applying it to the two terminals of the switch to be tested when open; one terminal will show "live" and one "dead." The switch is then closed and an indication is given as to whether the switch is connected in the "live" or "neutral" wire.

### Earthing and Insulating

Regulation 21, which is also subject to Exemption 1, requires the use of earthed or all-insulated switches, lampholders, and similar fittings in positions where persons handling them may be connected to earth, *i.e.*, in contact with machinery or standing on a metal, concrete, or stone floor or the like. Such fittings as do not comply with this requirement (particularly switch lampholders), must now be earthed, or, as is usually more practicable, replaced by those of the all-insulated type. Lampholders are sometimes overlooked, although they are liable to be gripped, and have thus caused fatalities.

Small machines such as coffee mills, meat mincers, cake mixers, &c., may be found to be properly earthed but to have metal switch covers insulated from the body of the machine which makes them particularly dangerous. A flexible earth connection can usually be arranged, that will also make the cover "captive."

Relief can obtained with regard to the replacement of switches and lampholders through Exemption 3 which, in effect, gives complete exemption to premises where electricity is used for lighting only and where floors are of wood and always dry and free from earthed machinery.

An undertaking will usually have no responsibility for portable apparatus or its means of connection to the mains since the Regulation concerned (13) applies to any a.c. pressure and to d.c. pressures in excess of 150 V. This Regulation, which also has the effect of prohibiting the use of switch lampholders for the attachment of portable apparatus, covers the necessity for the earthing or complete insulation of portable apparatus; the use, for uninsulated apparatus, of proper connectors giving earth continuity; and adequate protection of the connecting cable. In view of the desirability for stricter observance of this regulation with a.c. supply, the attention of the owner of the apparatus should be drawn to any shortcomings.

Regulations 28 and 29 are also subject to Exemption 1, the former provides that an "authorised person" shall supervise work where knowledge or experience is required to avoid danger, and requires that such work shall not be done by an unaccompanied person. No. 29 calls for the display in all premises of a notice giving instructions for the treatment of persons suffering from electric shock.

### What is a Factory?

It is often difficult to discover which premises in any area are subject to the Regulations, but help can be obtained from the district Factory Inspector whom I have always found ready to provide a list of such premises.

Factories or workshops in which persons are employed by the owner are subject to the Regulations; but domestic workshops and factories—which may be taken to mean that no outside paid assistance is employed—are specifically excluded under Exemption 7. Hotels, kitchens used only for the preparation and serving of food, shops, schools, churches, public halls, cinemas and theatres, are apparently not covered; theatres are subject to special regulations. The existence of a coffee mill, or the like, in a shop does not involve application of the Regulations provided its use is casual and that the machine is not fitted in a place set apart for the purpose and worked by a person wholly or partially employed to operate it. Laundries, bakehouses, &c., in hotels, hospitals, workhouses and the like, are covered and a public garage is regarded as a workshop.

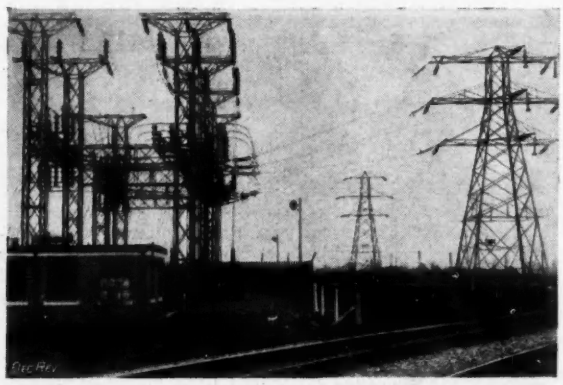
These notes cover material points on which there is a difference of application of the Regulations for d.c. and a.c. working, but they do not profess to cover every aspect.

# The Work of the Central Electricity Board

## Points from the sixth annual report

THE sixth annual report of the Central Electricity Board, which was issued this week (Whitehead, Morris, Ltd., 2s. 6d.), covers the year ended December 31st, 1933. It marks the transition from construction to general trading.

The grid was completed on September 5th last by the erection of the last tower, near Fordingbridge, on the outskirts of the New Forest, but before this the Board had began commercial operations in Central Scotland and Mid-East England (January 1st, 1933), and later started in S.E. and E. England and N.W. England and N. Wales (January 1st, 1934). Trading



**The Central Electricity Board's sub-station at Brimsdown**

is confined to giving bulk supplies to authorised undertakings, and no direct supplies are given by the Board to retail consumers. The output of all selected stations is purchased by the Board normally at the cost of production.

The grid tariff is fixed so that over a period of ten years the revenue will cover expenditure (including interest and sinking fund). The demand for electricity is potentially so great that towards the end of the period the surpluses are expected to be enough to compensate for losses at the outset. It is anticipated that the Board may not have to capitalise interest to the full extent permitted, and tariffs have been fixed on the principle of giving immediately to the supply industry the benefit of the later surpluses.

During the year the growth of demand in the two areas in which general trading had begun exceeded the estimates. The allocation of maximum output to the most economical stations resulted in 76 per cent. of the kWh supplied by the Board being produced at ten out of the twenty-five selected stations. Owing to the smaller proportion of spare plant required for an interconnected system the growth of load was met without incurring capital expenditure on generating plant. Income has covered operation and administrative expenses in these two areas with a credit balance of £4,320. Interest has been capitalised and the sinking fund mainly suspended.

### Increasing Security

Tests made at regular intervals showed that the rate of depreciation of insulators is low; the use of anti-fog and anti-dirt insulators is being extended. The year's experience confirms the confidence of the Board that the grid will definitely add to the security of the supply.

It is suggested that the grid, in conjunction with the systems of authorised undertakings, can materially contribute towards industrial revival; the grid has already enabled small undertakings to meet the demands of industrial consumers for supplies of a magnitude far beyond their capacity as isolated producers.

The grid will be extended from time to time to meet the growth of demand. During the year additional lines have been constructed between Bonnybridge and Falkirk, Folkestone and Dover, and Northampton and Kettering; a new grid point has been established at Beddington (Surrey) and additional facilities have been provided for increased supplies at several grid points.

Success with the 132/11-kV fuse-protected transformer at Glenlee (S. Scotland), mentioned in the previous report, has led to the design of a 300-kVA 132/11-kV transformer bank with oil-blast fuses (which can be renewed cheaply) for installation at Wooler on the Dunston-Galashiels 132-kV line. The use of outdoor metal-clad switchgear has been extended to lower-voltage transforming stations, and a 33-kV single-switch station so equipped, designed for ultimate extension to the three-switch type, is being manufactured.

### Battersea and Barking

During the year the first section of the new Battersea station (London Power Co.) and the 150,000-kW extension of Barking (County of London Co.) were put into commercial operation. Substantial progress was made with the construction of Fulham, Tir John (Swansea) and Galloway (hydro) stations.

In the design of its control system the Board's policy is to rent communication circuits from the Post Office. The control engineers obtain automatic indication of the switching conditions of the main grid switches, the position of the tapping switches on and the power transfer through the main transformers, and the loads carried by the more important generating stations. They can also use the circuits for telephony and for seven-point telegraphy. Transfers of load will normally be limited to short distances, but N.W. England has been successfully linked up with S.E. England temporarily.

It is stated that the substitution of electricity from the public supply for private plants has afforded greater flexibility in industrial expansion. Distributing authorities have taken advantage of new points of supply made available by the Board's secondary transmission lines for connecting up industries previously beyond the range of their networks, and new systems have been constructed in many rural areas.

The London to Brighton and Worthing electrification scheme of the Southern Railway, which depends for its supplies indirectly on the grid, completed its first year of operation, and the system is to be extended to Eastbourne and Hastings and from Orpington to Sevenoaks.

### Financial Provisions

Standardisation of frequency progressed in Cornwall, S. Wales and N.E. England. In Central England half the total load of Birmingham Corporation and the S.W. and S. Power Co. was changed over. The Board receives from the Ministry of Labour, under the Development Act of 1929, grants towards the interest on money borrowed for standardisation in N.E. England and for the purposes of the grid in that area and in S. Scotland. Interest and sinking fund charges incurred for frequency standardisation are recoverable by the Board from the Electricity Commissioners.

Progress during the year corroborates the estimate of

**The Central Board's metering arrangements and sub-station control board at Brimsdown**

£26,700,000 as the cost of constructing the initial grid. The total expenditure, including the cost of frequency changing, raising money, preliminary expenses and interest during construction, is expected to be within the £50,000,000 which the Board was empowered to borrow.

The Board's borrowing powers were increased by a Special Order to £60,000,000 to finance further interest payable out of capital, deficiencies in revenue in the early stages of the first tariff period, and to increase the capacity of the grid during the next ten years, although the present capacity is in excess of immediate needs.

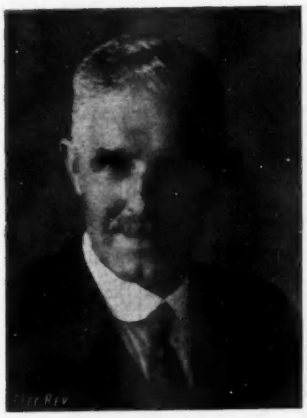
The Electricity Commissioners consented during the year to the Board's borrowing £2,550,750 for frequency standardisation and £2,594,250 for general purposes. Last June the Board issued £8,000,000 3½ per cent. stock (1963-1993) at 93¼ per cent. The Board has not applied to the Treasury for a guarantee under Section 29 of the Act of 1926 in respect of any of its stocks.

# MEETINGS AND DISCUSSIONS

## Current Topics and Opinions Expressed at the Institutions

### Quality in Rubber Cables

IT should not be concluded from the spectacular results obtained within the last ten years with paper-insulated cables that rubber cable technique is standing still, says Dr. P. Dunsheath (W. T. Henley's Telegraph Works Co., Ltd.), in a paper which was read before the London branch of the Association of Mining Electrical Engineers on April 10th.



Dr. P. Dunsheath

The different components of a cable are dealt with in turn, and the tests applied as a criterion of quality are briefly described. Since the electrical factor of safety of the dielectric is so high, wherein lies the necessity to consider quality? The answer is to be found in various physical phenomena and deterioration under service conditions.

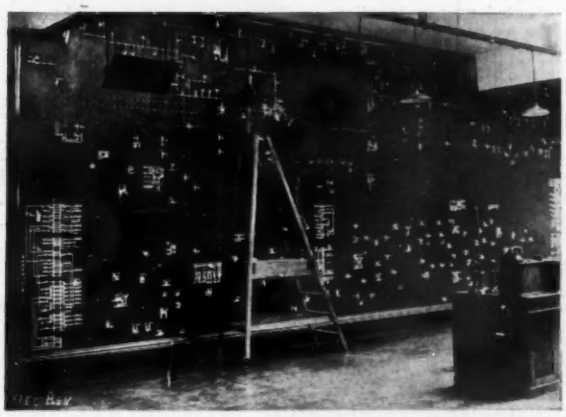
The chemical explanation of perishing, developed and established during the last few years, is that it is due almost entirely, if not wholly, to oxidation of the rubber. Therefore, where a rubber cable is to be worked under severe conditions it should be lead covered. To increase the heat resistance of a rubber dielectric and to improve its ageing properties generally, no matter under what conditions of service, the selection of the "mix" employed should be such as to provide resistance to oxidation. For this reason special chemical compounds, known as anti-oxidants, have been developed for adding to the rubber batch. Careful and prolonged research on this one factor alone has resulted in marked improvement of dielectric quality.

It follows, from the importance of oxidation as a deteriorating influence, that the efficiency of the layers of material applied over the rubber dielectric may have considerable effect in controlling the life of a cable. The first layer over the rubber is, of course, the proofed tape which is applied before vulcanisation and, in the standard cables, this is a cotton tape treated with red or black compound. Anything which can be done to produce a more homogeneous layer will not only resist the ingress of oxygen, but will also be more moisture resisting. Careful attention to the method of manufacturing this tape, therefore, so as to produce a heavy proofing as free as possible from pinholes and with a smooth surface is desirable, even if it may increase the cost. As the result of one particular investigation on this subject the moisture-resisting property of a standard tape employed in the factory was increased ten times.

In the same way as better tapes will improve the quality of a rubber cable, so will superior compounded braid. In one particular investigation occupying about two years, over two hundred different compounds were tested before one was finally selected for replacing the previous standard.

#### Trailing and Flexible Cables

The factors controlling the quality of tough sheathing are not quite the same. The mix of c.t.s. cable is designed primarily to impart mechanical strength. The tough sheath is subject to internal stress, and under deteriorating influences rubber fails more rapidly when under mechanical tension. Surface cracking is caused by a combination of oxidation and internal stress, and seems to be accelerated by exposure to sunlight.



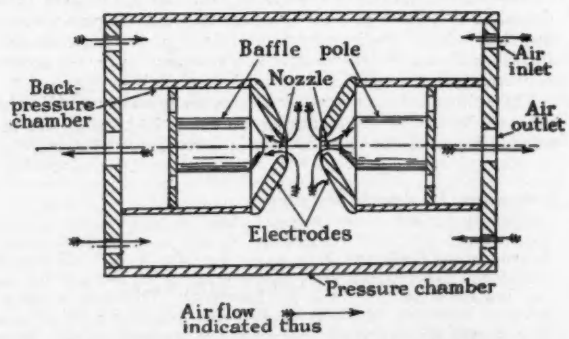
The system diagram board at Brimsdown "B" station (See page 519)

The improvement of trailing cable sheaths is closely allied, while the production of flexible lamp cords capable of withstanding high temperature is a triumph of co-operative research.

A short cinematograph film illustrated the paper.

### The Marx Gas-cooled Arc Convertor

AN account of recent Continental developments associated with the gas-cooled arc and its application to current-conversion is contained in the paper by Dr. W. G. Thompson,

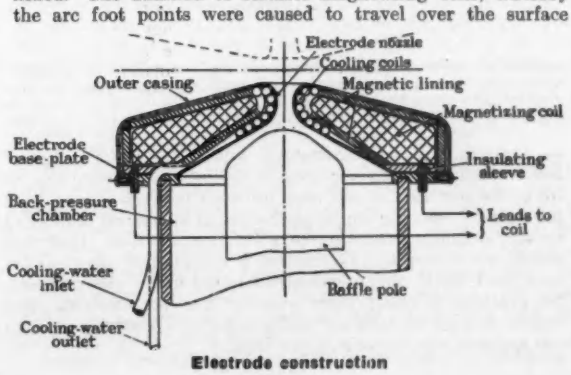



Diagrammatic arrangement of the arc chamber

which was read before the Institution of Electrical Engineers in London on April 12th.

Most of the work described was done in the Polytechnic High-voltage Laboratories at Brunswick, Germany, where the author has assisted in researches carried out by Prof. Dr.-Ing. Erwin Marx. The development and construction of the main convertor equipment and its auxiliaries are described, and some test results quoted. The adaptation of this type of "valve" for polyphase operation and inverted working, for which it is said to be particularly suitable, is discussed.

The early designs were of the point-plane type with an annular air-jet to sweep away the products of arcing, but the adoption of a periodic auxiliary high-frequency voltage for arc-ignition purposes enabled the power arc to be formed in either of the supply voltage half-waves and rendered the polarity of the rectifier independent of electrode form. This fact, and also the observed excessive heating of the pointed electrode on load, led to the substitution of a second plate in place of the pointed electrode. Using two plates with central orifices, the arc was quenched with each foot point drawn through to the reverse side of its electrode and out of the electrostatic field between the electrodes. The working principle of the present type of arc chamber was thus established. The addition of suitable magnetising coils, whereby the arc foot points were caused to travel over the surface




Electrode construction

of the electrode, and the incorporation of the necessary electrode cooling arrangements, enabled the units to be operated for long periods under load and gave practical significance to the device.

The pressure chamber is made of insulating material and its lightness simplifies erection, no special foundations being needed. The electrical ignition equipment can be made very compact, so that the floor space occupied is small, and for small current ratings it is possible to dispense with water cooling and the auxiliary magnetic field. Added to inherent simplicity is low first cost, and there is every reason to expect that the running cost will not prove to be in any way excessive.

The work already carried out has rendered it possible to meet all general requirements. Units of the extra-high-voltage type can be constructed for a full-load output of 10,000 kW single-phase, the corresponding polyphase output and efficiency being 60,000 kW and over 99 per cent., which are not necessarily upper limits.

Exhaustive trials have been carried out at the Zschornewitz power station of the State Power Supply Co., and endurance tests are now in progress.

## Audio-frequency Broadcast Relaying

AUDIO-FREQUENCY rediffusion by wire of broadcast radio programmes has certain basic technical and economic advantages as an alternative to direct wireless reception. The method has been extensively applied in Holland, where 50 per cent. of the Dutch listeners have their programme service "laid on" to their houses by wire connections. Relatively slight developments of the same nature have taken place in Great Britain.

Programmes transmitted by radio are picked up by a receiver situated where reception conditions are most favourable, and the output is fed, usually by land line, to an amplifier which raises the output level sufficiently to energise simultaneously several hundred loud-speakers connected to a conducting network of bare overhead wires supported on insulators attached to house chimneys, but sometimes carried on poles. The consumers' branch feeders are wired with lead-covered cable.

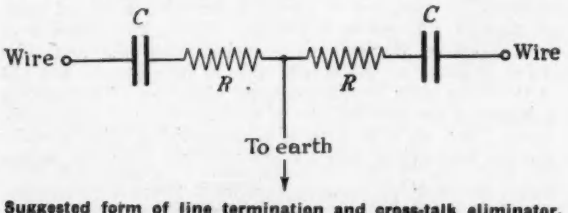
[*Elliott & Fry*

**Mr. P. P. Eckersley was formerly chief engineer to the B.B.C.**

The use of the existing telephone network for distribution would necessitate the provision of an amplifier in each consumer's house, while the employment of electric light and power mains to convey high-frequency carrier currents would involve the incorporation of a rectifier in consumers' apparatus. The common practice is to set up a separate network. The principles of the method are discussed in a paper by Mr. P. P. Eckersley, which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on April 11th.

The author analyses the effects set up by the interaction of the reactances and resistances composing the network and the loud-speakers, and shows that the received level, particularly towards the ends of the lines, varies enormously both with loading at certain audio frequencies and with audio frequency for a given loading. He believes that eventually underground cables or modulated high-frequency currents superimposed on existing networks will be preferred to bare overhead lines.

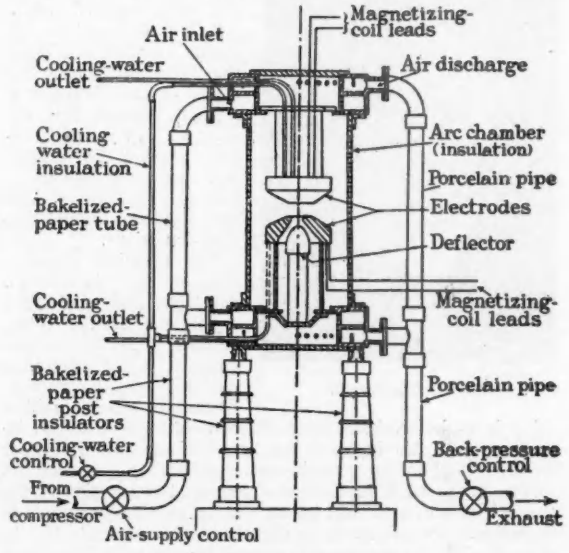
Meanwhile in order that the loss of bass reproduction at and near the ends of lines remote from the sending end shall be minimised, a series resistance of the order of 2,000 ohms should be connected in series with the loud-speakers, which should




**Suggested form of line termination and cross-talk eliminator.** *C* should be of the order of 0.1μF. and *R* will be greater the shorter the distance between the points where the device is connected to the lines. *R* varies between 1,000 and 2,000 ohms.

be preferably of the moving-coil type. To avoid a loss of bass reproduction greater than 6 decibels at a frequency of 50 cycles per sec. at and near the ends of lines remote from the sending end, the length of the line in kilometres multiplied by the number of consumers given service from that line should not exceed the number 600 if moving-iron speakers are used, or 1,200 if moving-coil speakers are used. Nevertheless, for practical working these numbers can be exceeded and factors as high as 1,000 for moving-iron and 2,000 for moving-coil speakers are tolerable, if not ideal.

To avoid an exaggeration of high frequencies due to the resonances set up between the capacitance of the lead wiring and the inductance of open-wire lines, it is advisable to connect resistances in series with condensers across the open ends of lines and sprays. These precautions will tend to make the sending-end impedance of the line more constant than when they are not taken, but the output transformers of the amplifier must, nevertheless, be designed to have the least possible leakage inductance.




**Gas-cooled arc rectifier assembly**

The amplifier power should be calculated for ideal conditions on a basis of 100 volt-amperes per line fed from the amplifier. If buried cable with lower-resistance conductors than those used for overhead networks is installed, power should be calculated on the basis of 400 millivolt-amperes per loud-speaker, or, allowing for the usual diversity factor, say 300 millivolt-amperes per loud-speaker. In practice, amplifiers feed as many as four lines and must supply, therefore, for a "practical" ideal 200 volt-amperes working into an impedance of the order of 6 ohms (minimum).

These generalised rules indicate how the distortions incidental to this form of wire broadcasting may be partly minimised or wholly eradicated. The analysis of the network performance allows the preparation of a specification for the amplifier necessary to supply power to the network.

The author has conducted experimental investigations in the area of Nottingham Rediffusion Services, Ltd., and has inspected many of the systems now in operation in Holland.

* * *

### Laminated Insulating Materials

The numerous uses, rather than manufacturing technicalities, of laminated materials bonded with phenol-formaldehyde were discussed in a paper by Mr. A. W. Sherwood (Bakelite, Ltd.) which was read recently in London before the INSTITUTE OF THE PLASTICS INDUSTRY. The author differentiated between this and other resin bonding agents, and emphasised the difference between the meaning of the term "laminated" when applied to plastic products and to belting, gears, plywood cores for armatures, &c., since in the latter cases no attempt was made to provide a permanently bonded homogeneous mass. From sheets, rods, and tubes of the material all sorts of components could be machined, but it was not always appreciated that the properties of different types and qualities were widely divergent. One of the most important uses of bonded laminated fabric was for making silent pinions and gear wheels for apparatus ranging from electric clocks up to 250-h.p. motors, electric fan blades, rail insulation, &c. Bonded laminated paper was employed principally for insulation purposes, while bonded laminated asbestos was also available.

# Correspondence

*Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession*

### Wireman and Electrician

There is much controversy at our works regarding the words "wireman" and "electrician." Could any of your readers please give me the true definitions of these terms?

*April 7th.* W. G. T.

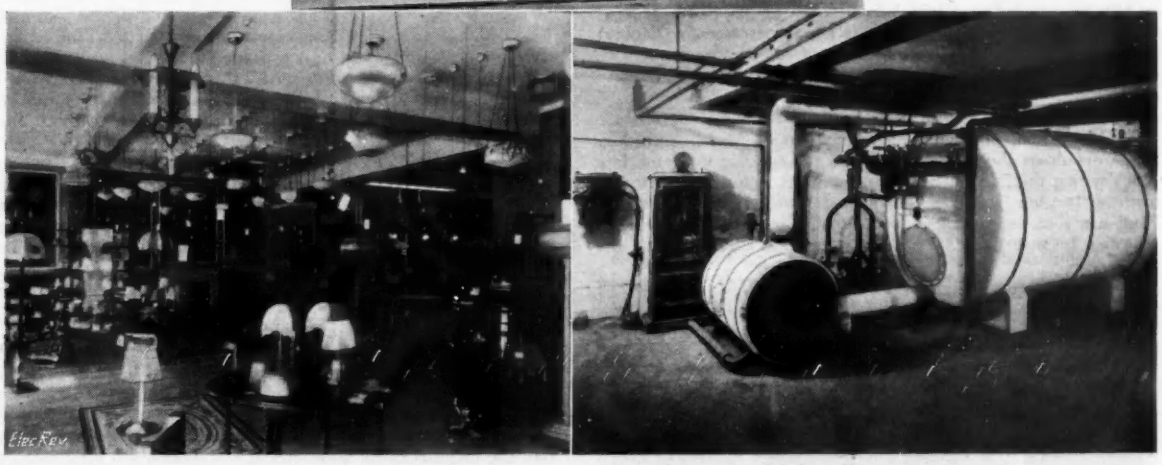
### Motor-driven Machine Tools

In Mr. Sims's excellent article on this subject in your issue of April 6th, he mentions the difficulties of installing such machines raised through the unreasonable regulations of certain supply authorities. He suggests, quite logically, that the permissible starting current of each motor should bear a relationship to the total installed horse-power and not to its own horse-power, but every motor manufacturer knows only too well how difficult it is to get a supply authority to see the reason of this argument.

Unfortunately, there are quite a number of borough councils in the London area whose electrical engineers appear to have inherited regulations through several generations without any attempt at modification, on the basis that "what was good enough for our fathers is good enough for us."

Higgs Motors, Ltd.,
A. W. Fisher, *London Manager.*

London, W.C.2, *April 9th.*



**The new Woking Showrooms (see page 532), showing the handsome exterior, one of the apartments and the electric boiler installation**

### The Period of a Patent

On page 380 of the Electrical Review of March 16th an abstract of a lecture by Sir Ambrose Fleming is given, in which he is reported as advocating the extension of the period of patent protection, which "is at present fourteen years in Great Britain." It is unfortunate that this statement has got into circulation, as the period for patent protection is sixteen years.

I think a correction is desirable as otherwise prospective patentees may be misled. Patentee.

*April 6th.*

### The Power Factor of Neon Signs

In answer to "Plumber's" inquiry in your issue of April 6th, the position of a supply undertaking with regard to the consumer is purely and simply a financial one. The annual loss to a supply undertaking on the small neon sign mentioned would, taken over an average of three hours a day for 300 days per annum, approximate to £2. Five hundred such merchants in a town, city or area would cause a loss of £1,000 per annum to the supply undertaking.

The loss per annum on this sign is comparable with the annual lighting revenue of the average householder. If, then, the undertaking must be cognisant of this so-called "trivial" type of offender, so then it is essential also to penalise the bigger offenders. A power-factor clause in the tariff, offering a bonus in addition to a penalty, deals equitably with all consumers, and the supply undertaking cannot be said to "pick" on any particular individual or item.

The remedy is in the consumer's own hands. A power-factor correcting device would save its cost in a year. Neon sign manufacturers will ensure a readier sale of their wares by fitting a power-factor correcting device. H. F. Russell.

Ilford, *April 7th.*

### Rapid Progress at Sheffield

In your issue of April 6th you referred to the proposed extensions at Sheffield. The industries of this city, I am pleased to say, have during the last three to six months taken a turn for the better, as compared with the very heavy depression which has existed during the last six or seven years, in which trade has been exceedingly bad.

During the last four years the Department has been reorganised and attention has been concentrated on the furtherance of electricity supply to the smaller industries and in the domestic sphere. This policy has increased output year by year by about 10 per cent. and during this period we have connected 57,000 consumers (practically 90 per cent. increase) and connected 66,000 kW of additional load. During the current year arrangements have already been made to connect 48,000 kW. The kWh sold in 1933 totalled 250 million.

During these four years, against heavy odds, we have been able to reduce tariffs to our consumers to an extent of £40,000 a year. We have been able to pay off over £300,000 of unremunerative capital—this against heavy additional expenditure, brought about by revaluation of the undertaking from time to time, which has increased the payments of the undertaking to the city rates from £65,000 to £120,000 per annum; the latter arrangement came into force on April 1st.

Special tariffs have been designed for encouraging the basic trade of the city, and the low charges which have been made applicable to the smelting of steel and all the heat treatments necessary in the production of steel articles, within the last twelve months, have led to the installation of new large and small furnaces of all types for smelting, re-heating and annealing. The low charges have enabled Sheffield to make steel, where previously large amounts of the same commodity were purchased from abroad.

Your readers may remember that owing likewise to the savings made in the Department, I was able to obtain an agreement with one of the largest firms in the country, Messrs. Thos. Firth & John Brown, Ltd., to supply them with 20,000 kW with an estimated consumption of 80 million kWs per annum, to replace their two modern power stations which are to be scrapped in accordance with the agreement. The low tariffs have therefore benefited the city's industries, and, indeed, the nation as a whole.

Increased business is being carried out to-day in Sheffield—

large developments have been taking place these last few years in preparation for this return to trade—and with the highly organised Sales Department which we have, large power is being changed over to public electricity supply and existing plant which has been out of commission and new plant are being connected to the supply mains. About £300,000 has been spent during the last twelve months in laying down mains, sub-stations and equipment, and the increasing use of electricity has fully justified the extensions.

This factor has considerably influenced the plans of the Central Electricity Board in connection with generation in the Mid-East England Area, in which Sheffield is the largest undertaking. Due to its geographical position and the development and scope, the Board agreed that additional plant was necessary and that the greatest portion should be installed in Sheffield.

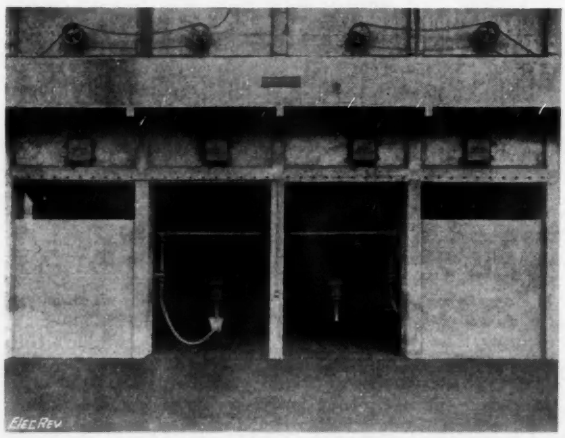
The Board is issuing a direction in respect of these extensions, pursuant to Section 5 (1) of the Electricity (Supply) Act, 1926, with the result that the City Council has unanimously resolved to extend the Blackburn Meadows No. 2 power station by a 30,000-kW turbo-alternator with boilers, cooling towers and auxiliaries and the present power station by a 30,000-kW turbo-alternator, with boilers and auxiliaries at an estimated expenditure of £770,000. The new and existing plant will be able to supply all the needs of Sheffield, and enable electricity to be "exported" at a low cost.

It is nearly twelve months ago since the Blackburn Meadows No.2 station was opened by Prince George, and the new extension which is being made in the existing building will make that section complete in itself. Owing to the foresight of my predecessor, who designed and constructed the present station in 1904, we are to-day able to install a 30,000-kW set in the place of two existing turbines, but at that date it seemed impossible to foreshadow the possibility of designing so large a turbine. Great economies are looked for in the utilisation of this generating unit which is situated on the very verge of the load itself. The new plant is to be in operation by October, 1935.

E. Morgan, *General Manager*,
Sheffield, *April 6th*. Electricity Supply Dept.

## Prepayment Meters

In his article published in your issue of March 30th Mr. Page dismisses the three-coin prepayment meter in just a few lines which might well be paraphrased as follows: "A three-coin meter has just been developed, but one might just as well use a meter arranged for penny coins only." May I be allowed to assure Mr. Page through your columns that his



**The discharge from the electrostatic precipitator at the Brimsdown "B" station. (See page 519)**

view is not supported by numbers of users of prepayment meters, judging from the ever-increasing demand for this particular type of meter, and from the persistent rumours that other makes of meter based on the same principle are about to be launched on the market.

Not only are supply authorities demanding the three-coin meter, but consumers also are showing a marked preference for this type. The reasons are, I venture to suggest, in each case obvious, but to reassure Mr. Page I recapitulate some of them.

Supply authorities prefer it because (a) Ample proof now exists that the revenue collected by a three-coin meter exceeds that collected by a siugle-coin meter. The amount of the excess depends largely on the class of consumer and on whether one compares it with a "shilling" or a "penny" meter, but figures are on record which show increases of from 10 per cent. to 700 per cent. Only one type of meter need be stocked to cover the requirements of any class of consumer, *i.e.*, those who normally take a "penny" as well as those who normally take a "shilling" meter, and that, be it noted, without the necessity of making the slightest change in the meter.

Why consumers prefer the three-coin meter can perhaps best be illustrated by a little parable. For the sake of argument let us assume that Mr. Page buys his "juice" *via* a meter that takes shillings only. One wet, miserable evening after a really jolly time at the local church bazaar, or even at the pictures, he arrives home late and when he switches on there is "no reply." Vainly he searches his pockets for the necessary shilling, but alas! whilst pennies, sixpences, aye, even possibly half-sovereigns abound, there is ne'er a shilling amongst them. It is too late to send in to Mrs. Jones next door to borrow a shilling, since these people are early birds and have retired long ago; so finally the Page family retires to bed cold, shivering, and in the dark, duly setting the alarm clock so that some representative shall be awake in the morning to welcome the milkman to borrow the humble but necessary "bob."

Let this calamity overtake Mr. Page but once and I suggest that we shall have a willing convert to the three-coin meter.

British Sangamo Co., Ltd.
E. H. Miller,
Enfield, *April 5th*. *Joint Sales Manager.*

## The Search for Electricity

Presumably E.D.A.'s national campaign should show the best results in urban areas in course of development. In view of this it would be interesting to know how much support is being given to the campaign by those most likely to benefit from it.

Some weeks ago I placed an order for a house in a neighbouring district supplied with electricity by what is probably the largest combine of urban electricity undertakings in the South of England. The glad tidings have apparently been spread to all interested parties, and milkmen, butchers, bakers, &c., have lost no time in drawing my attention to the merits of their wares. The local gas company is well in the lead and has supplied me with application forms for gas and coke, catalogues of apparatus, and a particularly good cookery book specially written for use with thermostatically controlled cookers. I should imagine that the average person would be "sold" on gas cooking before getting halfway through the book.

And electricity? Were it not for the wires dangling through the ceilings I might be forgiven for thinking that there is none. True, a local contractor has offered to assist me in my selection of fittings and has sent me a leaflet illustrating a totally inadequate cooker which I am comforted to note he will wire free of charge if I place the hire order through him, but from the people whose job one imagines it is to sell electricity, not a word.

The district in question contains some hundreds of new houses. Presumably householders wanting electricity have to ask for it and, if they are new to the district, have to unearth the secret hiding place of the electricity authority. If I were not already electrically minded by virtue of several years' employment in the electricity supply industry, and if I had not had the comfort of an all-electric home I should unhesitatingly believe the sales talk of the gas man. Even now I am not so sure.

R. Hewetson.
Croydon, *April 5th*.

## The Electrical Development of Heat Flow

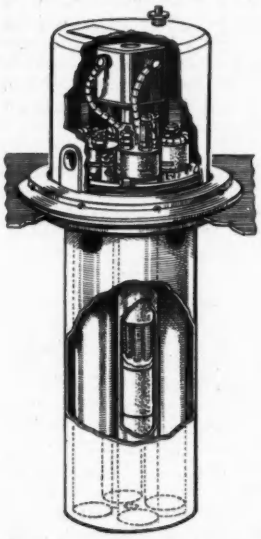
A NEW heat-flow meter applicable to the measurement of thermal losses from industrial furnaces and the thermal conductivity of furnace materials at temperatures up to 600-1,000 deg. C. (1,112-1,832 deg. F.) forms the subject of a communication from Dr. E. Schmidt and J. Werneburg of the Technische Hochschule, Danzig, to the *Zeitschrift des Vereines deutscher Ingenieure*. The Raisch and Schropp heat-flow meter, depending upon the thermo-electric measurement of the temperature difference between the faces of a strip of rubber by a number of thermo-couples in series, has been widely applied to the determination of heat losses from pipes and other surfaces at temperatures not exceeding about 212 deg. F. Depending on the same general principle, the new apparatus employs a number of thermo-couples, electrically in series, located in a series of tunnels 0.039 in. in diameter bored near the top and bottom surfaces of a slab of ceramic material, which is then applied to or, for permanent installations, recessed into the furnace setting from which the heat flow is to be determined. The thermo-electric e.m.f. generated by the thermo-couples, of nichrome-constantan or other more refractory metals, is measured by a millivoltmeter which is calibrated to indicate directly the corresponding heat flow in kg.-cal. per sq. metre, or B.th.u. per sq. ft. per hour. A ceramic block, 4¾ in. by 2¼ in. by ⅜ in., accommodates thirty-eight thermo-couples, half near each of the faces of the block, and the thermo-electric e.m.f. varies nearly linearly with the heat flow and is of the order of 70 mV when the heat flow is 5,166 B.th.u. per sq. ft. per hour. The effect of the thermal resistance of the ceramic slab in reducing the heat flow can be corrected by reference to a chart.

# New Apparatus and Devices

## for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

### An Easily Fixed Circulator

Elimination of boss soldering when fixing; a perfect water joint with gaskets; no metal-to-metal contact between the tanks and flanges; and increased mechanical strength as the result of gripping the heater dome between the boss and the flange are outstanding features claimed for the "Thermo-Circulator" recently introduced by AIDAS ELECTRIC, LTD., St. Leonard's Road, N.W.10.



The construction of the Aidas "Thermo-circulator"

It consists of a boss, a large nut, a locking nut and a flange, all of bronze, four heating element tubes and a thermostat mounted on the flange, and a detachable 2½-in. seamless copper circulating sheath enclosing the group of element tubes. The seamless tinned copper element tubes house high-quality nickel-chrome resistors mounted on steatite and unglazed porcelain formers.

A "Sadia" mercury-switch type thermostat is fitted as standard, and the crystal-black finished terminal cover has a detachable porcelain bush for cable entry. The cover is secured by a thumb nut which can be sealed. On the flange there is a red earthing terminal. The circulator is available in lengths of from 16 in. to 24 in., 24 in. to 30 in., 30 in. to 36 in., and 36 in. to 42 in., with 1-, 2-, 3- and 4-kW loadings at prices ranging from £5 to £7.

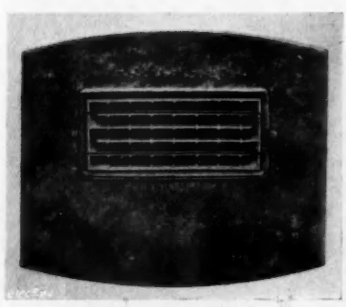
### New Motor Car Aerial

Better reception with less interfering noise is claimed to result from the use of a new radio aerial for motor cars which is being made and installed by the NATIONAL RADIO SERVICE Co., 15, Alfred Place, Tottenham Court Road, W.C.1. The "Natrasco" aerial is priced at 32s. 6d. and consists of copper gauze wrapped in rubber-proofed material and enclosed between two sheets of paxolin. Sufficient flexibility is thus provided for inconspicuous mounting and the exclusion of moisture prevents leakage to earth which so frequently diminishes reception.

Simple bolts are provided for fixing these strips underneath the running boards or wings, one on each side of the car. The two strips are connected in series diagonally, so as to render the pick-up non-directional, while the lead-in can be made very short and the receiver can be placed in any position inside the car.

### "Electroway" Inset Fires

ELECTROWAY HEATERS, LTD., Loughborough, are now making inset fires provided with sheet-metal back boxes which can be arranged for spiking into openings in tiled surrounds of standard dimensions, *i.e.*, 12 by 8in., 12 by 12in., and 12 by 16in. Alternatively, the sheet-metal back box can be provided with fins spot-welded on, so that the boxes can be moulded into the tile surrounds when the latter are made. The fire front is screwed into the back box by means of four plated screws.



An "Electroway" inset fire

The prices of the three models available, loaded at 1, 2, and 3 kW, are 16s. 6d., £1 4s., and £1 14s. respectively. and they can be obtained in marble finish or in various mottled vitreous-enamelled colours. All models, including the 1-kW model, have a separate switch for each firebar.

### Some Recent American Developments

The March issue of *Electrical Merchandising* (New York) contains notes or advertisements of a number of interesting new ideas in electrical appliances. One company offers a cooking range which although "mass produced" possesses many optional features to suit purchasers' requirement (or whims). The legs are adjustable to secure the correct height; a compartment at the back can be fitted with an auxiliary toaster or radio set; an adjustable lamp illuminates the hob; an electric clock is provided, and there is a choice of four finishes.

A small cooking appliance called a "compakt" consists of a framework with an open top covered in by a hinged plate into which a heating element is inserted in the form of a kind of drawer; great things are claimed for this.

A small night-light is fitted into a plug which can be inserted into a standard socket on an a.c. or d.c. circuit. One cooker advertised has an illuminated "temperature controller" fitted at the side at a convenient height for the temperature to be read from an edgewise pattern thermometer.

A heater for brooders is so arranged that when a chick steps on to a little platform a mercury switch is tilted putting on the heat which is again switched off when the chick leaves the platform.

A new floor polisher is of very low construction and the weighted brush is set well out from the handle, enabling the polisher to get under furniture.

### A Light-measuring Instrument

MESSRS. BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17, have introduced a new light-measuring instrument known as model "B" lightmeter. This gives direct reading—that is to say it indicates visually, by means of a moving needle, and with an accuracy quite sufficient for all but laboratory purposes the amount of light (measured in ft.-candles) falling on any particular surface. The scale of intensities, which ranges from 0 to 50 ft.-candles, is divided into five segments, A, B, C, D and E. Thus passages, where a low intensity of light (1 to 4 ft.-candles) is recommended, fall in section A, while at the other end of the scale drawing offices which need a high intensity (40 to 50 ft.-candles) appear in section E. Installations are classified under these sections on the back of the instrument.

The model "B" lightmeter

The sensitive needle is excited by means of a photronic cell, and all that is necessary is to place the lightmeter on the spot where it is desired to measure the light intensity and then take the reading on the scale. The instrument is self-contained, weighs only 10 oz., measures 4¼ in. by 2¾ in., and is priced at 96s.

### Radio Potentiometers

A very comprehensive range of volume controls is manufactured by the WATMEL WIRELESS CO., LTD., High Street, Edgware, Middlesex. Type 6 potentiometer is specially designed for compact total enclosure and screening. It is priced at 5s. 6d. and is made in any value up to 15,000 ohms.

The pressed metal case is 1 in. deep and 1.5 in. in diameter, fitted with a single-hole fixing brass bush with a registering slot. The element is wire wound on a bakelite former, either linear or logarithmic, and the spindle is insulated from the contact arm. Positive action stops are provided and a self-cleaning wiper contact.

Type 7 is similar, but is fitted with a totally enclosed snap-action switch rated to carry 3 A at 250 V; its price is 7s. 6d. Type 24 L is a special heavy-duty variable resistance intended for controlling television motors, laboratory equipment, and electro-medical apparatus. It is priced at 15s. 6d., being 1.5 in. deep with a base approximately 3.5 in. square. The wire is wound on two slate formers, which are mounted on a cast-iron frame, resistance being varied by rotating a contact slider spanning the two formers.

### Woven Fibre Lamp Standards

There is nothing novel in woven fibre furniture, but its applications to table standards is a new departure which MESSRS. W. LUSTY & SONS, LTD., Bromley-by-Bow, E.3, have developed. The floor standard which we illustrate is 5ft. 6in. high, with a shade diameter of 23in. and a base diameter of 15in.; it is fitted for two lamps and is available in standard colours at 76s. (83s. 6d. silk lined). The table lamp, which is 21 in., high, with a shade diameter of 12 in., costs 24s. (25s. 6d. silk lined), and is, of course, fitted for only one lamp. In this case the switch is operated by a pendant chain.

Two unusual woven fibre lamp standards

D

# New Metropolitan-Vickers Products

AMONG the new apparatus developed by the Metropolitan-Vickers Electrical Co., Ltd., is a range of totally enclosed protective panels (Types AMC and DMC) for crane motors up to 550 V. The equipment comprises double-pole d.c. or triple-pole a.c. line contactor circuit-breaker with renewable contact tips and blow-out and arc chutes, magnetic over-current relays or inverse time lag, push-button switch with external mechanism for resetting the line contactor circuit-breaker, double-pole switch-fuses with external operating handle for controlling the contactor operating coil circuits and pilot lamp and hand lamp.

Left, auto-transformer starter for a 50-h.p. 440-V s.c. motor. Right, a.c. protective panel for four-motor crane

For the control by push-button or pilot switch of non-reversing three-phase s.c. motors of from 15 to 300 h.p. at 600 V a contactor auto-transformer starter is available (KMC70/75). The tappings give 45, 65, or 80 per cent. of full line voltage and the tap selected is connected to the motor by a five-contact switch. A pendulum timing device opens the starting contactor and closes the running contactor in a predetermined time. The triple-pole thermal over-current relay is of the hand-reset latched pattern.

An 11-kV, 100-A outdoor air-break switch unit (FLR), consisting of two independently gang-operated triple-pole switches mounted on a common channel-steel base-plate, has been designed for H-pole mounting. The switches are of the horizontally opening rotating insulator type and are suitable for use as a double selector on a through line where a tee-off is made or as a line sectioning or tapping switch. The horizontally operated lever is worked by a torsion shaft. Each moving knife blade has a 90-deg. opening. The cast-brass fixed contact forms a guide for the blade. Arcing horns are made of steel-cored copper rod.

### Overhead-line Fuses

As a low-priced ground-operated fuse link for isolating transformers up to 250 kVA on the 11-kV side a combined single-pole combined fuse isolator (WF2) is offered which is capable of breaking magnetising current. It can be mounted vertically or at angles up to 45 deg. from the vertical plane.

The HRC 650-V fuses are made in three standard sizes of carrier rated at 100, 200 and 400 A. All have a short-circuit breaking capacity of 20,000 kVA. For normal loads up to 20 A, tinned copper is used, but the larger ratings have soft tinned copper strips. The carrier consists of a fibre tube filled with a mixture of inert powders. The carriers can be rewired and refilled on site.

Miniature control boards are being built with mimic diagrams which show automatically changes in switching arrangements and whether these have been made manually or by the functioning of protective relays. The recent introduction of miniature instruments of high-grade accuracy for all circuit indications and the use of coloured light numbers in place of semaphore discs has enabled a considerable reduction in dimensions to be obtained.

These instruments are flush mounted, and although they have an external diameter of 4½ in., the scale length is 4 in.; three circuits can be accommodated on a panel 17 in. wide.

A further reduction in panel space has been made, removing the indicating lamps from near the circuit-breaker control switch and combining them with the new design of mimic diagram to give colour indications. The diagram still consists of aluminium alloy strips and symbols mounted on steel panels, but the isolators and oil circuit-breakers are represented by slots and circles on the steel panel located in the diagram at the points corresponding to the situation of the switches in the main circuit. When in operation, the slots and circles are seen as illuminated areas in the main diagram; the colour indicates the contact position of the corresponding apparatus and is changed automatically by auxiliary switches on the apparatus. Light is obtained from pygmy lamps diffused through the symbol opening from a matt white surface.

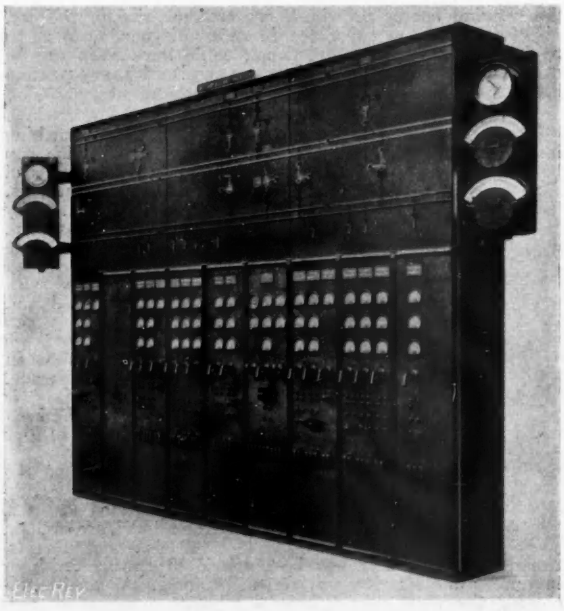
The approximate overall length of this design in one recent instance was half that of the equivalent full-size board, and the height was over 10 per cent. less.

### Indicating and Measuring Instruments

New instruments include type OL remote position indicators, DE mercury-motor d.c. watt-hour meters, and NE m.d. indicators. The first is a modified dynamometer watt-meter for a.c. or d.c. circuits. The transmitter embodies a potentiometer resistance with tappings connected to a multi-point switch for step-by-step indications or with a sliding contact for continuous indication.

The receiver has two fixed field coils and two equal resistances, all in series across the supply mains; the moving element embodies a coil through which current is led by two ligaments. One end of the moving coil is connected to the middle point of the field circuit and the other is connected through a high resistance to the switch arm on the transmitter. Both the deflecting torque and the restraining torque are influenced equally by any change in the operating voltage, making the instrument independent of ordinary voltage variations. The field coils tend to hold the pointer at the mid-position on the scale; if the transmitter switch is moved from the mid-position the current flowing through the moving coil will deflect the pointer. The power taken by this instrument when used in a 230-V circuit is about 9 W.

The mercury-motor meter is suitable for two-wire circuits up to 550 V. Compensation for temperature changes is designed to keep the variation in speed with a temperature change within 1 per cent., and a biasing permanent magnet in the field is claimed to prevent hysteresis error, even with the voltage variations common on traction circuits, from exceeding 2 per cent. The meter consists essentially of a rotor shaft fitted with two discs. The lower disc is of copper and has radial slots to eliminate eddy currents; the upper disc is of aluminium and rotates between the poles of the two braking magnets.



Miniature control board with illuminated mimic diagram

The demand indicators are supplied for time settings of 15, 20, 30 or 60 minutes.

# Incentives to Salesmanship. By E. G. Plucknett

## Methods of rewarding services

THE supply industry realises more fully to-day than a short time ago the great importance of its "sales departments." A number of excellent articles have recently appeared in the ELECTRICAL REVIEW covering such subjects as showroom staffs, canvassers, &c., and the present contribution will deal with yet another aspect of this subject, giving a few useful hints to executives and others who are in charge of supply undertaking sales departments.

A great deal can be learnt from the methods used by the corresponding departments of large modern commercial organisations. Surely it makes very little difference, as regards general principles, whether your sales staffs are selling foodstuffs, furniture, electrical appliances, or merely "electrical service"! I do not claim that the following remarks on providing electricity salesmen with the necessary incentives to do great things are original, but I wish to stress an aspect of commercial sales management adapted to the electricity supply sales department.

[*Whitlock & Sons, Ltd.*

**Mr. Plucknett is on the staff of the Wolverhampton Corporation Electricity Department**

In commerce a great deal of attention is given to methods for providing salesmen with the necessary incentives to procure the maximum business at the minimum cost and in the right proportion. Let me deal with these incentives in some detail.

*1. "The Incentive of "Selling for the sake of Selling."*

I know of nothing which will give a true salesman more "kick" than the feeling of having succeeded against great sales resistance. This keenness counts for a great deal, and forms an essential quality in a salesman, but it is not sufficient to keep a man up to scratch *all* the time. The number of objections, lack of co-operation in other departments, and unappreciativeness of personal effort from superiors, still prevalent even to-day, may seriously damp the ardour of any budding young salesman, or older man for that matter.

*2. The Monetary Incentive.*

This incentive is one not to be found to any great extent in electricity undertaking sales departments, partly because, although it forms one of the greatest incentives known, it has such a number of "snags" from the electrical point of view that it is generally ruled out as being impracticable.

This is largely due to the fact that commission is usually considered in relation to turnover judged on a money basis, and this is where most of the trouble arises. For instance, in the case of a showroom staff paid on a part salary and commission basis, the staff will obviously concentrate on selling high-priced appliances which will give them the greatest individual totals in the time expended in securing sales, the result being that the selling of load, and the electrical service generally, becomes a very secondary consideration. As for hired apparatus, such as cookers, wash-boilers, water heaters, &c., these are bound to suffer very materially. The method of overcoming these objections, and yet still utilising this important incentive, is dealt with later. (See No. 4.)

*3. The Incentive of Competition.*

This brings me to the most important section of the article, namely, the allocating of "quotas." One can safely say that there is not a commercial sales organisation of any importance in existence which does not work on a quota system. Yet how many electrical salesmen (excluding, of course, the manufacturers' salesmen) are given a quota to work to? Curious though it may seem, the spirit of competition which is promoted by salesmen's quotas forms probably the finest possible incentive. Not only does the quota system provide a basis for competition between salesmen, but also between a salesman himself and his own quota. It provides him with a goal, something to work for, a state so often found lacking in many electricity sales departments.

The quota system also provides the sales manager (or other executive in charge of a sales department) with a definite basis on which to plan his year. He, in turn, should be given a quota to work to, which would, of course, be the total of his sales staff's individual quotas. This provides him with an incentive to give his salesmen every possible help, since his only chance of beating or even reaching *his* quota is for each individual salesman to reach his own particular quota.

Although it is not proposed to deal with the question of the settling of quotas here, it should, nevertheless, be emphasised how important it is to exercise great care in order to see that the quota is high enough to give the salesman something to really work for, and yet is not so high as to be impossible of attainment, which will only dishearten him and defeat its own object. If a quota is merely based on cash turnover the same drawbacks apply as in No. 2, and this is where the "Point System" comes in.

*4. The Incentive of the Point System.*

The increasing popularity of this system with large commercial organisations proves beyond any doubt its enormous advantages as a method of providing the necessary incentive and, if necessary, payment of salesmen. It combines the advantages of Nos. 1, 2 and 3, and removes most of the disadvantages, since it is so adapted that it can give credit for other aspects of a salesman's work which may not show immediate results in the order book. For those to whom this system is not already known an example may be given to illustrate its usefulness.

Each salesman should be given a yearly quota, divided into weeks, of so many points. The word "salesman" in this instance is intended to imply every person attached to the undertaking whose job it is to sell; no matter whether he is only canvassing for cookers on hire, he is (or should be!) still a salesman. The actual number of points allocated to different items must, of course, be decided upon by each sales manager to meet individual conditions.

The following are just a few examples of sales work for which points may be allocated; it will readily be seen what potentialities this system offers.

| | |
|---|---|
| For every kilowatt of additional load sold ..... | points |
| For every cooker signed up on hire ..... (If necessary, of course, sub-divided into different sizes.) | ,, |
| For every cooker signed up on hire-purchase ..... | ,, |
| For every water-heater signed up on hire ..... | ,, |
| For every water-heater signed up on hire-purchase | ,, |
| For every wash-boiler signed up on hire-purchase | ,, |
| For every assisted-wiring installation signed up ... | ,, |
| Window displays ..... | ,, |
| Sales of lighting fittings, shades, &c., per £1 list value | ,, |
| Sales of domestic appliances, per £1 list value ... | ,, |
| Sales of fires, per £1 list value ..... | ,, |
| Sales of refrigerators, per £1 list value ..... | ,, |
| Sales of cleaners, per £1 list value ..... | ,, |
| Sales of washers, per £1 list value ..... | ,, |
| Sales of cookers, &c., per £1 list value ..... | ,, |

One of the chief features of the scheme is that if it is required that the sale (or hire) of any particular appliance or service should be "pushed," then the necessary incentive can easily be arranged by simply allocating a few more points to the appliance in question. If it is proposed to add the extra incentive of commission, already referred to, then it is easy for the commission to be based on the actual service rendered by each salesman, as distinct from just "cash turnover."

### Periodical Conferences

Finally, may I suggest to those supply undertaking sales executives who are not already doing this to "Keep Selling your Salesmen the Idea" by holding weekly, or, at any rate, monthly, sales meetings? These meetings need not be lengthy, but if properly conducted will generally prove popular with the sales staff and of inestimable value to the sales manager. It is often a good idea to arrange for a manufacturer's representative to come and give a short lecture on the selling points of some new appliance, and then to throw the meeting open to discussion. The interchange of ideas on different aspects of selling, difficulties met with and how they have been overcome, will prove interesting and very instructive, if properly supervised by the sales manager.

There still is, and will be for some time to come, a colossal amount of selling, in all its branches, to be done in the supply industry, and we shall need every ounce of selling power we can procure to cope with it.

# Fair Trading in Holland. By H. R. Taunton

## Problems which have been left unsolved

IN an article on "Fair Trading," published in the ELECTRICAL REVIEW of March 30th, I made allusion to a report issued by "Committee C" of the V.E.H.I., set up to consider and, if possible, to remedy the abuses from which the electrical industry in Holland has been suffering; abuses very much the same as those which evoked our own "Committee D" and its Fair Trading Policy.

As the Dutch report has not been published here, and so might remain unknown to most readers of the ELECTRICAL REVIEW, the following short summary of it may interest those of them who have studied the general question. It takes the form of citing certain of the many problems confronting the industry, discussing them in detail, without, however, attempting a definite solution of any of them.

The first three questions are as follows:—

Should manufacturers sell only to wholesalers, and these only to retailers? ("Retailers" throughout may be taken to include contractors, not otherwise mentioned.) Ought manufacturers to consider the interests of retailers who do not buy from them? Are they and wholesalers to be debarred from competing against retailers for the orders of large buyers: hospitals, theatres, hotels, &c.?

The answer to all these questions is generally negative. It is suggested that the retailers' troubles are largely due to their own cut-throat competition; that many of their complaints of unfair trading are in effect against members of their own class, "semi-wholesalers" and agents for manufacturers. The remedy is in their own hands. There is nothing to prevent them competing for the largest orders; but they cannot expect the big suppliers to sit passive in their factories and warehouses watching good business opportunities lost by inexperience and lack of energy.

### Consumers' Purchasing Associations

In any case, the issue is largely with the purchasing public. Large institutions and firms are prone to doubt the resources of the smaller man, the retailer, and to prefer, naturally enough, dealing with large concerns. If they do, the manufacturer cannot well insist on their approaching him through a third party.

The only solution to the problems involved lies in the "loyalty" of manufacturers and wholesalers to the interests of the united industry. They have to remember that the cumulative purchases of the retailers form a large portion of their turnover, and, whatever they may do about the large orders, at least they can refrain from competing for the small orders of the general public. There are, of course, "border-line cases" to be decided on their merits; but the present report offers no suggestion as to where that border-line is to be drawn.

The next item instances a proposed boycott by a "provincial group of retailers" of manufacturers who refuse to pay them commission on all sales in their territory. A suggestion so fantastic to our ideas seems hardly worth the careful attention it is given, summed up, inevitably, in a flat rejection. Arising from the last, it is asked: "Is it against trade morality for purchasers to unite in "groups," in "central purchasing offices," to secure better terms? Here is meant associations of the general public not individually entitled to any discount from list prices.

### Remuneration for Services

This question touches us more nearly, for similar associations are not unknown in England, though their activities are more familiar in other trades than ours. The reply of the V.E.H.I. is that the publication of list prices by a manufacturer presupposes that sales will only be made through a distributor, for whose services a definite discount is reserved. That direct buyers, who render no services, should expect any of that remuneration is unreasonable. Unfortunately, by banding together in sufficient number, they can often extort it from manufacturers who are perhaps naturally tempted by the sum of their orders.

The injustice of this illegitimate trading is greater in the electrical industry than in any other. The retailer—the contractor—is not only a distributor, but gives the public a special service in small but always urgent matters of maintenance, involving much care and trouble, for a negligible return. He is indispensable to the well-being of the electricity-using public, and he might reasonably expect, therefore, not to be passed over when it is a question of a substantial purchase carrying a fair but well-earned profit.

Retailers complain that certain manufacturers and wholesalers—other than their own suppliers—are unfairly undercutting their markets. What, if any, steps should their suppliers take to meet these protests? Certainly they should support their distributors if these have maintained the fixed prices and terms agreed with them. But the further question of the form that support should take is left unanswered by the Committee.

In fact, the report as a whole is inconclusive. The Committee responsible for it has apparently been content to survey the difficulties and to postpone, presumably—though it does not promise—any concrete proposals for overcoming them. Perhaps they will be encouraged to make them by the more definite terms of our own Fair Trading Policy. In the meantime, their report makes interesting reading. At least it consoles us with the assurance that not only in England are the ethics of fair trading severely complicated by the weaknesses of human nature.

# United States Electrical Exports in 1933

BELOW are given the values of the exports from the United States of nearly all the principal groups of electrical machinery and apparatus last year, with a note of the increases and decreases compared with 1932.

The total value of this trade in 1933 was $43,580,000 as compared with $43,382,000, an increase of $198,000. Although this increase affords a contrast to the results last year of the electrical export trade of both Great Britain and Germany, it is not so remarkable as it appears at first sight because had it not been for the advance in the trade in radio material there would have been a considerable decline in the total value of exports of an electrical character.

| | 1933. $000. | Inc. or dec. |
|---|---|---|
| Generators, d.c. | 62 | − 12 |
| Generators, a.c.— | | |
| Under 2,000 kVA | 80 | − 78 |
| 2,000 kVA and over | 326 | − 363 |
| Steam turbine generator sets | 746 | + 637 |
| Accessories and parts for generators | 210 | − 699 |
| Arc-welding sets | 164 | − 111 |
| Self-contained lighting outfits | 137 | + 22 |
| Batteries— | | |
| 6 and 12 V storage | 746 | − 71 |
| Other storage | 243 | − 4 |
| No. 6 dry cell batteries | 237 | + 53 |
| Flashlight batteries | 1,551 | − 319 |
| Radio B and C batteries (dry) | 172 | − 6 |
| Other dry and wet cell primary batteries | 69 | − 18 |
| Power transformers over 500 kVA | 110 | − 512 |
| Distribution transformers, 500 kVA and less | 211 | + 18 |
| Instrument transformers | 50 | − 34 |
| Other transformers | 116 | − 103 |
| Battery chargers, non-rotating | 26 | — |
| Double-current and motor generators, dynamotors, synchronous and other converters | 150 | − 102 |
| Switchboard panels, except telephone | 137 | − 182 |
| Power switches and circuit-breakers over 10 A | 548 | + 46 |
| Fuses | 84 | + 5 |
| Watthour and other measuring meters | 190 | − 42 |
| Indicating instruments | 293 | + 28 |
| Recording instruments | 125 | − 133 |
| Other elec. testing apparatus | 388 | − 153 |
| Lightning arrestors, choke coils, reactors and parts | 310 | − 26 |
| Motors, ¼ h.p. and under | 404 | − 89 |
| Motors, over ¼ and under 1 h.p. | 137 | − 8 |
| Stationary motors, 1–200 h.p. | 509 | + 13 |
| Stationary motors, over 200 h.p. | 87 | + 24 |
| Railway motors | 47 | − 1 |
| Elec. locos., mining and industrial | 195 | + 59 |
| Elec. locos., railway | — | − 787 |
| Elec. motor trucks | 35 | + 9 |
| Starting and controlling equipment— | | |
| For industrial motors | 403 | − 76 |
| For railway and vehicle motors | 96 | + 28 |
| Portable electric tools | 400 | + 77 |
| Accessories and parts for motors | 676 | − 95 |
| Household refrigerators | 4,472 | + 1,112 |
| Commercial refrigerators up to 1 ton | 1,130 | − 242 |
| Parts for elec. refrigerators | 2,060 | + 97 |
| Flashlight cases | 294 | − 6 |
| Electric fans | 170 | − 53 |
| Incandescent lamps for automobiles, flashlights and Christmas trees | 110 | − 9 |
| Other metal filament lamps | 480 | + 67 |
| Other electric lamps | 36 | − 8 |
| Searchlights and airport beacons | 45 | + 4 |
| Floodlights | 72 | + 26 |
| Household washing machines | 179 | − 75 |
| Domestic vacuum cleaners | 211 | − 166 |
| Other domestic motor-driven devices except tools | 209 | + 33 |
| Elec. flat-irons | 91 | + 4 |
| Elec. cooking ranges | 155 | + 14 |
| Other domestic heating and cooking devices | 241 | − 9 |
| Industrial electric furnaces, ovens and other heating devices | 166 | − 55 |
| Therapeutic and X-ray apparatus | 657 | + 16 |
| Radio transmitting sets, tubes and parts | 743 | + 79 |
| Receiving sets | 9,324 | + 2,002 |
| Receiving tubes | 2,623 | + 610 |
| Receiving set components | 2,783 | + 266 |
| Loud speakers | 338 | − 118 |
| Other receiving set accessories | 314 | − 27 |
| Telegraph apparatus | 164 | + 6 |
| Telephone instruments | 68 | − 13 |
| Other telephone equipment | 731 | + 62 |
| Bells, buzzers, annunciators and alarms | 95 | − 79 |
| Starting, lighting and ignition equipment | 834 | + 217 |
| Insulating material | 190 | − 56 |
| Metal conduit, outlet and switch-boxes | 343 | + 36 |
| Sockets, outlets, fuse blocks and lighting switches | 643 | − 50 |
| Interior lighting fixtures | 429 | + 7 |
| Exterior lighting fixtures | 95 | − 25 |
| Other wiring supplies and line material | 321 | − 61 |
| Other electrical apparatus | 2,287 | − 318 |

# Business and Industrial Notes

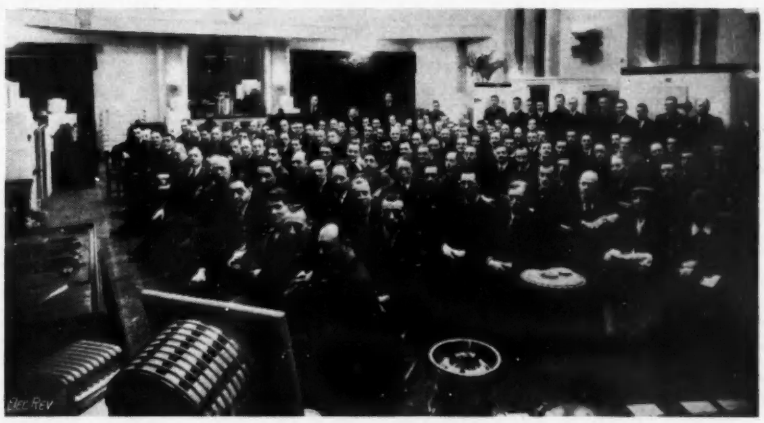
**The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures**

## Electrical Contracting at Middlesbrough

At a recent meeting of the General Purposes Committee of the Middlesbrough Town Council allegations of slipshod work owing to keen competition were made in a letter from the District Joint Industrial Council for the Electrical Contracting Industry, Newcastle. The letter referred to the growing tendency to shoddy work, which generally happened where, owing to fierce competition, the contractor had quoted such a low price that in order to make the job pay he had to employ men at less than agreed rates or had to employ an unusual number of boys. The letter asked that the Middlesbrough Corporation should insist that qualified men should be employed on electrical contracts and that the standard rates of wages should be paid. The town clerk pointed out that in all Corporation contracts trade-union rates of wages and conditions had to be observed.

## A B.T.-H. Refrigerator Convention

A convention of B.T.-H. refrigerator dealers and a commercial exhibition, organised by the International Refrigerator Co., Ltd., was held on April 6th at the Café Royal, Regent Street, W. It was attended by over 150 dealers from various parts of the country. The day was occupied by a series of lectures on advertising and sales promotion, with particular reference to refrigeration, the speakers being Messrs. H. C. Timewell, J. I. West, A. C. Cox, J. Raymond, A. W. Weekes, A. P. Young, W. H. Stiles, G. M. Daniels, W. H. Partridge, C. F. A. Docker, R. J. Simpson, G. N. Robins, Sir William Crawford, and Sir Edward Penton. The new B.T.-H. refrigerator mobile exhibition coach, a picture of which appears on page 542, was seen by the majority of the dealers for the first time, and many bookings for the coach to operate in various parts of the country were made. Two new refrigerators, suitable for hotel, restaurant and catering use were shown for the first time. These two models (RM-170 and RM-240) are operated by the B.T.-H. hermetically-sealed refrigerator unit on the top of the cabinet, and have internal capacities of 17 and 24 cu. ft. respectively. At the conclusion of the business session the delegates were conveyed to Olympia to view the B.T.-H. refrigerator stand at the Ideal Home Exhibition. We reproduce herewith a photograph taken at the convention.



B.T.H. refrigerator dealers at a convention held at the Café Royal last week

## The Bakers' Exhibition

The Bakers' Exhibition which opened in Manchester on Tuesday last, and continues until April 19th, is the first of its kind for ten years, and interest in it is widely spread over the whole of the North-West area, comprising the counties of Yorkshire, Cheshire, Lancashire, Cumberland and Westmorland. The General Electric Co., Ltd., is exhibiting various types of "Magnet" baking ovens, of which there are 350 examples now operating in baking establishments in Manchester, Liverpool, Leeds, Sheffield and all the principal towns in the North-West area.

## The South African Radio Market

The Department of Overseas Trade has issued a report furnished by H.M. Trade Commissioner at Johannesburg on the market for radio apparatus in South Africa.

## New Municipal Showrooms

The Colchester Electricity Committee has approved revised plans by the borough engineer for the erection of district offices at Manningtree, at a cost of £1,925. The borough engineer has been asked to prepare alternative plans for the proposed office and showroom at Walton-on-the-Naze.

## Coal for London Electricity Works

In the course of his speech to the shareholders in the Grand Union Canal Company the chairman, Mr. W. H. Curtis, stated that they were losing a certain amount of coal traffic on their Regent's section, due to the closing down and part-time running of some of the generating stations on the canal owing to the opening of the Battersea power station by the London Power Company, the coal for which comes round coastwise at very low rates on account of shipping freights being carried at very cut prices.

## Australian Duties on Dry Batteries

The Australian Tariff Board recently held an inquiry into the duties on dry batteries and dry cells imported into the Commonwealth. Mr. Albert Jewell, representing the Ever-Ready Co. (Great Britain), Ltd., said that the manufacture of dry batteries in Australia had opened up new avenues of employment, and had resulted in substantial reductions in prices, despite improved quality. The amount paid by the industry in Australia in direct and indirect wages was about £90,000 a year, materials absorbed £30,000, and Australian shipping benefited to the extent of £5,000 annually. His company had expended many thousands of pounds on buildings, plant and machinery. It claimed fiscal peace so that it could go on developing and reducing prices.

Mr. W. F. Winter, manager of Herberholds Dry Batteries (Australia) Pty., Ltd., asked that the existing duties should be retained. He said that as a result of the imposition of the tariff of 1929 his firm, whose headquarters were at Utrecht, Holland, began the manufacture of batteries in Australia. During the past year an additional £4,000 was spent on the installation of machinery. Under lower duties it seemed doubtful if England would gain any advantage, as on the present-day overseas quotations for batteries practically all the business would go to Japan or China. Mr. C. M. Glynn, of the Century Storage Battery Co., Ltd., urged the retention of the existing duties. He said it was the intention of his company to equip a modern factory in Sydney for the manufacture of batteries, the total expenditure on plant and material being £20,000.

Mr. R. W. Caldwell, on behalf of the Joint Committee for Tariff Revision, referred to the Tariff Board's statement that excessive profits had been made by manufacturers of dry batteries. He contended that efficient local manufacturers would be amply protected by duties of 35 per cent. British, and 55 per cent. general tariff. An industry which had had ample time to establish itself and could not compete with a 78 per cent. protection did not deserve any consideration. Mr. F. N. Nicholls, manager of Ellis & Co. (Australia), Ltd., said that consumers were being unduly penalised to shelter an industry using only a small proportion of Australian raw material and providing comparatively little additional employment.

## French Import Quotas

The *Board of Trade Journal* for April 5th contains a list of the quotas fixed for the importation of United Kingdom goods by orders dated March 31st. The period covered is the three months ending June 30th. Specific quantities are laid down for dynamo-electric machinery, transformers and rectifiers (633 quintals), switchgear and distribution equipment (808 quintals), Bergmann tubes (423 quintals), and accumulators (272 quintals). In some cases the British share is merely a part of that allocated to other countries.

## Recent Contracts

The Harland Engineering Co., Ltd., reports that the volume of orders from overseas is gratifying and includes twelve pumps, each 800 g.p.m. at 850 ft. head, for Jerusalem, and twenty pumps driven by motors up to 550 h.p. for South Africa. The larger work at present in hand for home orders includes three 1,500-kW traction rotary convertors for Glasgow Corporation, two pumps, each 3,500 g.p.m. at 200 ft. head, for the Metropolitan Water Board, and two Harland patent interlock calender drives. Other work includes a borehole-type pumping plant for colliery de-watering, with a 240 h.p. 40/50 cycle motor; two pumping sets, each with 200 h.p. 40/50 cycle motors; a stainless steel pump, for 250 g.p.m. at 1,400 ft. head, for corrosive liquid, a repeat order; and a 300 h.p. colliery winding motor. Switchgear orders have increased in volume and have been received from India and Canada, as well as all parts of Great Britain. The range in hand varies from a 600-V l.p. cubicle switchboard to 11-kV metal-clad

gear, 22-kV stationary cubicle gear and 33-kV outdoor-type current transformers for the Central Electricity Board.

The English Electric Co., Ltd., has recently received an order from the Delhi Electric Supply & Traction Co., Ltd., for a 1,030-kW "Fullagar" generating set. The plant will comprise an English Electric 6.Q "Fullagar" opposed piston mechanical injection engine, having a normal full-load output of 1,470 b.h.p. at 300 r.p.m., direct-coupled to an English Electric 1,030-kW alternator with overhung exciter, generating power at 6,000/6,600 V, three-phase, 50 cycles.

The General Electric Co., Ltd., has received an order from the London Passenger Transport Board for fifty railway motors for additional motor coaches for service on the Piccadilly line. The motors are of 240 h.p. each, and are similar to those already supplied by the company for use on the Underground railways.

Messrs. F. Reid Ferens & Co., Ltd., Newcastle-on-Tyne, have received a contract from the Electricity Supply Board for Northern Ireland for the supply and erection of the electrical equipment for the lighting of twenty-eight towns in Northern Ireland. The carrying out of the contract will occupy about twelve months and employ 200 workmen. Recently Messrs. Reid Ferens & Co. completed a l.p. network in the towns of Lurgan and Omagh, Co. Tyrone.

## Turkish Import Quotas

The Turkish Government has fixed import quotas for the six months April-September. The quota for "transformers, commutators, resistances, coils, magnetos, sparking plugs, convertors, distributors, ventilators, vacuum cleaners and the like, mounted or not" is 24,000 kg. For the importation of electric motors and dynamos a licence from the Ministry of Economy is required.

## Czechoslovakian Electrical Imports

During February last electrical machinery and apparatus valued at 10,690,000 cr. was imported into Czechoslovakia as compared with 18,951,000 in the corresponding month of last year.

## Showroom Extensions at Woking

Owing to increasing business the Woking Electric Supply Co., Ltd., has found it necessary to provide additional showroom and office accommodation in its existing building in Cobham Road, and these have recently been completed under the supervision of Mr. F. Woods, the resident engineer. The extensions have practically meant the reconstruction of the building, and the new showroom now has two large windows, through which the whole of the interior can be viewed. The premises, which are equipped with a wide variety of up-to-date electrical apparatus, are warmed throughout by water which is heated electrically, while hot water is provided for sink and lavatory basins by separate electrically heated tanks.

Provision is made for the operation of electric cookers in the kitchen at the rear of the showrooms, and here also are shown electric refrigerators, washing machines, suction sweepers, floor polishers, and such small apparatus as irons, kettles, toasters, &c. A small but well appointed bathroom shows the application of electricity for bath and lavatory water heating. Here there are ultra-violet-ray lamps, "sun-ray" lamps, towel airers, shaving mirrors, and heaters fixed to the ceiling. The building throughout is wired in enamelled, welded, screwed steel conduit. In addition to the numerous lighting and power points, there are staff telephones, staff indicators, synchronous electric clocks, and signal bells. A reinforced concrete staircase leads up to the offices, while a service lift has been installed by Waygood-Otis, Ltd. The whole of the street lighting of Woking, which now embraces the old parish of Byfleet, is carried out by the Woking Co., as well as the lighting in the parish of Littleton. The company hires out electric cookers and kettles, whilst it makes a feature of electric water heating. It has a large electric wiring and contracting business and constantly employs between thirty and forty skilled wiremen, and undertakes wiring work of any magnitude. It has carried out some very large installations in the neighbourhood, including a number of churches. Reductions have recently been made in the ordinary tariff for lighting and in the running charge under the "all-in" tariff. Pictures of the showrooms appear on page 525.

## Sequel to a Fatality

At the Stockton County Police Court recently a fine of £10 was imposed on Imperial Chemical Industries, Ltd., for a breach of the Electricity Regulations under the Factory Acts. It was stated by the prosecution that a workman at the company's Billingham works was using a portable lamp, the wires of which became defective and rendered the fitting "alive." The man came into contact with a pillar and received a fatal shock. The company pleaded carelessness on the part of the deceased man and submitted that there was no case to answer. The magistrates overruled this, however, and found the company guilty.

## Electrical Activity

The B.E.A.M.A. "Index of Activity," gives a figure of 62.0 for February (1924=100), as compared with 61.0 in January, and 64.1 in February, 1933.

## Birmingham Fair in May Next Year

The Department of Overseas Trade announces that the Birmingham Section of the British Industries Fair, 1935, will be held from May 20th to May 31st inclusive. The London Section will, however, as formerly, open on the third Monday in February, *i.e.*, February 18th. This decision follows a recommendation of the *ad hoc* Committee of representatives of the London and Birmingham Sections of the Fair set up by Col. J. Colville, M.P., Secretary to the Department of Overseas Trade, to consider the question of the date of the Birmingham Section.

## Social Events

The Sloan Electrical Social Club's annual dinner was held at the Royal Hotel, Woburn Place, W.C., on Saturday last. Mr. L. G. Sloan, president, occupied the chair and he was supported by Messrs. M. V. Ely and J. McLennan, directors. After the loyal toast, Mr. Sloan proposed "The S.L. Social Club" and mentioned that the Sloan Electrical Co. was formed thirty-five years ago. Before that, however, he was actively engaged in the industry. Mr. W. J. Bensley, in the course of his response, expressed the Club's regret at the inability, through illness, of Mrs. Sloan, Mrs. Ely and Mrs. McLennan to be present. In proposing the toast of "The Company," Mr. H. D. Denman mentioned that it was Mr. Ely's birthday (and his wife's) and on behalf of the Club presented him with two cut-glass vases. Mr. Ely replied and announced that Mr. Denman had been appointed general manager of the company. The health of the visitors was toasted by Mr. McLennan, and Mr. H. A. Lingard (B.T.-H. Co.) responded. The dinner was followed by a dance.

## Those Wicked Electricians

Competition between gas and electricity was referred to in the speeches at the spring conference of the North British Gas Managers' Association held at Perth on April 6th. Lord Provost Hunter suggested that their propaganda for the benefit of gas was misdirected. They were using the wrong kind of advertisements and putting them in the wrong places, and he felt they would get better value from the right kind of advertisement in the provincial districts. Mr. Lewis Bain, manager of the Banff and Macduff District Gas Co., in his presidential address, said that "electricians" were at work all the time to create an atmosphere hostile to gas. Up and down the country they were representing that gas was associated with bad housing conditions, that the use of gas was a thing of the past, and that there should be electrically equipped houses in order

**The stands of British National Electrics, Ltd., and the General Electric Co., Ltd., at the Ideal Home Exhibition, which is now in progress**

that tenants might enjoy the privileges of the rich and have electricity for all purposes. It was almost invariably found, however, that consumers were largely in favour of gas. Tenancy agreements containing provisions for the exclusion of gas were one of the things which the gas industry had definitely got to fight. In towns where the electricity undertaking was municipally owned, and the gas undertaking was controlled by private enterprise, fair competition was extremely difficult to obtain, especially when pronounced, biased influences, clothed in the mantel of pseudo public service, were exerted by over-enthusiastic civic heads in favour of electricity. Instances were known where, despite obvious economic factors, gas undertakings had been deprived of the whole of the public lighting and other public business on the pretext that the municipality was honourably and morally bound, in the interests of the ratepayers, to support the "child of their adoption" (the electricity department). In conclusion, Mr. Bain said that gas was not, as their electrical friends would wish people to believe, a thing of the past, a back number, or a dying industry.

## The Ideal Home Exhibition

Messrs. Stokes Appliances, Ltd., inform us that they are exhibiting their table cooker, &c., at this exhibition.

## The Paddington Train Indicator

In the note on this subject in our last issue we said that the power consumption was 200 kWh per hour. This is manifestly wrong—the actual figure is 200 Wh.

## Advertisement Corrections

The capacity of a battery mentioned in the advertisement of the Alton Battery Co., Ltd., in our issue of March 30th, was given as 1,300 Ah; this, we are informed, should have been 13,000 Ah.

The number of the British Standard Specification for plyboards quoted by W. T. Henley's Telegraph Works Co., Ltd., in their last week's advertisement is 531/1934, not 931/1934 as stated.

## Price of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

| CHEMICALS, ETC. | Price, April 11th. | Fortnight's Inc. or Dec. |
|---|---|---|
| *a* Acid, Oxalic ... ... ... ... per cwt. | 50s. | — |
| *a* Ammoniac, Sal ... ... ... per ton | £40 | — |
| *a* Ammonia, Muriate (large crystal) ... „ | £38 | — |
| *a* Borax ... ... ... ... ... „ | £17 | — |
| *a* Copper, Sulphate ... ... ... „ | £19 15s. | — |
| *a* Potash Chlorate ... ... ... per lb. | 3½d. to 4½d. | — |
| *a* „ Perchlorate ... ... ... „ | 6d. | — |
| *a* Shellac T.N. ... ... ... ... per cwt. | £4 18s. | — |
| *a* Sulphur Commercial ... ... per ton | £11 | — |
| *a* „ Roll ... ... ... ... „ | £11 | — |
| *a* Soda Chlorate ... ... ... per lb. | 3¼d. to 3¾d. | — |
| *a* „ Crystals ... ... ... per ton | £5 to £5 5s. | — |
| *a* Sodium Bichromate, casks ... ... per lb. | 4d. nett. | — |
| **METALS, ETC.** | | |
| *b* Aluminium, Ingots ... ... ... per ton | £100 to £105 | — |
| *b* „ Wire ... ... ... per lb. | 1/1 to 1/9 | — |
| *b* „ Sheet and Foil ... ... „ | 1/2 to 2/9 | — |
| *p* Babbits Metal and Anti-friction Metals.— | | |
| Grade I ... ... ... per ton net | £217 | £7 inc. |
| Grade II ... ... ... ... „ | £148 | £5 inc. |
| Grade III ... ... ... ... „ | £70 | £2 inc. |
| *c* Brass (rolled metal 2" to 12" basis) per lb. | 7d. | — |
| *c* „ Tubes (solid drawn) ... ... „ | 9d. to 9½d. | — |
| *c* „ Wire, basis ... ... ... „ | 7½d. | — |
| *c* Copper Tubes (solid drawn) ... „ | 10d. | — |
| *g* „ Bars (best selected) ... per ton | £62 | — |
| *g* „ Sheet ... ... ... ... „ | | — |
| *g* „ Rod ... ... ... ... „ | | — |
| *d* „ (Electrolytic) Bars ... ... „ | £37 | £1 inc. |
| *g* „ „ Sheets ... „ | £36 10s. to £37 | £1 inc. |
| *d* „ „ Wire Rods ... „ | £43 | 10s. inc. |
| *d* „ „ H.C. Wire ... per lb. | 7¾d. | ⅛d. inc. |
| *f* Ebonite Rod ... ... ... ... „ | 1/3 to 1/6 | — |
| *f* „ Sheet ... ... ... ... „ | 1/3 to 1/6 | — |
| *n* German Silver Wire ... ... ... „ | 2/5 | — |
| *h* Gutta-percha, fine ... ... ... „ | nom. | — |
| *h* India-rubber, Para fine ... ... „ | 5d. | — |
| *i* Iron, Pig (Cleveland No. 3) ... per ton | 62/6 | — |
| *i* „ Wire galv. No. 1, P.O. qual.... „ | £20 | — |
| *g* Lead, English Pig ... ... ... | £12 15s. | 55s. dec. |
| *g* Mercury ... ... ... ... per bot. | £10 15s. to £11 | — |
| *c* Mica (in original cases) small ... per lb. | 6d. to 3/6 | — |
| *e* „ „ medium ... „ | 4/- to 8/- | — |
| *e* „ „ large ... „ | 8/6 to 17/6 & up | — |
| *p* Phosphor Bronze, plain castings ... „ | 1/1 | — |
| *p* „ „ drawn bars & rods „ | 11d. | — |
| *p* „ „ rolled strip & sheet „ | 11d. | — |
| *p* „ „ wire ... ... „ | 11½d. | — |
| *o* Platinum ... ... ... per oz. | £7 15s. | — |
| *d* Silicium Bronze Wire ... ... per lb. | 8½d. | ½d. inc. |
| *r* Steel, magnet, in bars ... ... „ | 7½d. | — |
| *m* Tin, Block (English) ... ... per ton | £240 15s. to £242 15s | £2 15s. inc. |
| *k* „ Wire, Nos. 1 to 16 ... ... per lb. | 3/8 | — |

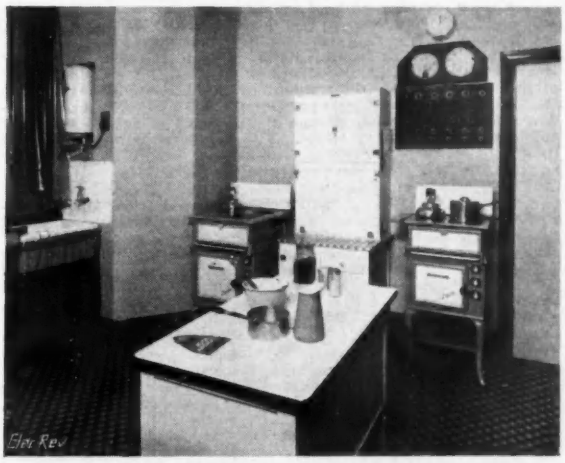
Quotations supplied by:—

*a* G. Boor & Co.
*b* The British Aluminium Co., Ltd.
*c* Thos. Bolton & Sons, Ltd.
*d* Frederick Smith & Co.
*e* F. Wiggins & Sons.
*f* India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
*g* James & Shakespeare.
*h* Edward Till & Co.
*i* Bolling & Lowe.
*j* Richard Johnson & Nephew, Ltd.
*m* P. Ormiston & Sons.
*o* Johnson Matthey & Co.
*p* C. Clifford & Sons, Ltd.
*r* W. R. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

## A Jackson Electric Kitchen

The accompanying illustration shows a corner of the kitchen which has been specially arranged for the training of demonstrators in electric cookery at the premises of the Jackson Electric Stove Co., Ltd. The models "91J" (of which over 20,000 were sold during 1933) and the "94J" are shown in this view. Other models in the Jackson "90" series are also installed at other points in the kitchen. The equipment includes a 1½-gallon "Quickservice" water heater having a loading of 500 W and thermostatically controlled. The switchboard is chromium-plated and is arranged for six cookers. The bottom line of switches controls the plugs to each cooker and the top line of switches enables the unit meter to be placed in circuit with any cooker as required. A pilot lamp is also provided for each switch. Suitable meters are



**A Jackson electric kitchen for the training of demonstrators**

provided for recording the units consumed and the voltage. An electric synchronous clock is also part of the kitchen equipment. Three-pin plugs are arranged at various positions round the kitchen for suitable connection to the cookers. In addition the equipment includes a drying cabinet for dish cloths, towels, etc., and heating is provided for by a 3-kW inset type fire. The lighting arrangements consist of four day-light Holophane fittings mounted directly on the ceiling. A cookery demonstration was given on Jackson cooking equipment last week at the Brixton Road showrooms of the South London Electric Supply Corporation, Ltd. Demonstrations have also been given in the exhibition house at Newcastle-on-Tyne, while arrangements have been made to demonstrate electric cookery in the various districts served by the South Somerset & District Electricity Co., and the Ballyclare Electricity Distribution Co., Ltd. The Jackson Electric Stove Co. has a comprehensive display at the Southend electrical exhibition which is now in progress.

## Trade Announcements

The Glasgow depôt of Messrs. Ward & Goldstone, Ltd., has been removed to 80, Blythswood Street, Glasgow, C.2 (telephone: Central 6681).

Fluxite, Ltd., has removed to Dragon Works, 63, Bermondsey Street, S.E.1 (telephone: Hop 2632).

The Manchester office of Messrs. Bruce Peebles & Co., Ltd., has been removed to 2, Brazil Street, Manchester. (Telephone: Central 5548.) The office remains under the control of Mr. G. G. L. Preece, M.I.E.E., sales manager (North).

Santon, Ltd., has removed its London office to 54, Bloomsbury, W.C.1. (Telephone: Museum 3110.)

## An Austrian Exhibition in London

A trade section on the lines of a sample fair is to be a feature of the Austrian Exhibition which is to be held under the patronage of the Austrian Government at Dorland Hall, Regent Street, London, from April 16th to May 12th. This section will display the products of various industries, and there will be electrical exhibits including lamps and radio.

## New Catalogues and Lists

**Ruston & Hornsby, Ltd.**, Lincoln.—An illustrated leaflet describing a range of small generating sets suitable for emergency and port lighting duties.

**Taylor, Tunnicliff & Co., Ltd.**, 110, Cannon Street, E.C.4.—A pamphlet on "Factors which Contribute towards Insulator Reliability."

**G.W.B. Electric Furnaces, Ltd.**, Elecfurn Works, North Road, Holloway.—A leaflet outlining the merits of "Eternite" case-hardening compound.

**Edison Swan Electric Co., Ltd.**, 155, Charing Cross Road, W.C.—Publication No. H.C.932, briefly describing "Ediswan" electric storage water heaters, and a leaflet (H.C.973) relating to the "Bandolero" electric fan.

**M. & C. Switchgear, Ltd.**, Kelvinside Works, Kirkintilloch, Glasgow.—Pamphlets Nos. R21/6 and G141/1 dealing with d.c. starting panels and push-button switches respectively.

**British Electric Domestic Appliances, Ltd.**, 3, Hanover Court, Moor Lane, E.C.—An attractive showcard in silver, red and black, advertising the "Mary Ann" vacuum cleaner.

**General Electric Co., Ltd.**, Magnet House, Kingsway, W.C.—A leaflet containing a diagram showing a wide range of interchangeable "Claudegen" neon window displays.

**Newman, Hender & Co., Ltd.,** Woodchester, Glos.—A comprehensive and well-produced catalogue, strongly bound, illustrating and describing the company's principal products, including valve cocks and fittings.

**Marconiphone Co., Ltd.,** 210-212, Tottenham Court Road, W.—Cut-out letters forming the word "Marconi," mounted on a neat wooden base for shop-window display.

**Foster Engineering Co., Ltd.,** Apex Works, South Wimbledon, S.W.19.—An illustrated and priced catalogue of "Apex" switch and fusegear.

**Heenan & Froude, Ltd.,** Worcester.—Leaflet No. 104 drawing attention to automatic strip and wire forming machines previously marketed by Messrs. James Ward (Worcester), Ltd., for which the rights of manufacture and sale have been acquired by the company.

## Bankruptcy Proceedings

**I. Walker** (trading as I. M. Walker and D. B. Beavan), radio and electrical retailers, 2, The Arcade, Swiss Cottage Station, aHmpstead, N.W.—The statutory first meeting of creditors was held on April 9th at London Bankruptcy Buildings. The debtor Beavan states that prior to September, 1932, he was in charge of the radio services department of the Edison Swan Electric Co., Ltd. He entered into partnership with Walker in September, 1931; trading was successful for about fifteen months but subsequently fell away badly. The partnership was continued in the hope of better times and in the possibility of raising further capital. The firm's capital of £225 was provided by Walker's father and has not been repaid. The insolvency of the firm is attributed to bad debts, trade depression, and insufficient working capital. The liabilities are roughly estimated at £900 against assets valued at £315. A resolution was passed for Mr. W. A. J. Osborne to act as trustee of the estate.

**T. Ward,** 7B, Richmond Street, Bridlington, Yorks, radio and battery engineer.—The first meeting of creditors was held on April 5th at the Official Receiver's offices, Bank Chambers, Scarborough, when a statement of affairs was submitted showing gross liabilities of £425, of which £339 was expected to rank for dividend, and net assets of £77, leaving a deficiency of £262. Debtor attributed his failure to living above his income and incurring debts before commencing business. The case being a summary one was left in the hands of the Official Receiver as trustee.

**S. M. Bjornsen,** 31, Pelham Street, Nottingham, electrical engineer.—The first meeting of creditors herein was held on April 6th at the Official Receiver's office, 22, Regent Street, Park Row, Nottingham, when it was stated that the liabilities amounted to £203, and there was a deficiency of £194. Debtor attributed his failure to heavy expenses and trading at an insufficient margin of gross profit. The case being a summary one was left in the hands of the Official Receiver, as trustee.

**C. E. Wooton,** electrical engineer, 10, Cemmaes Terrace, Collett Road, and 109, Marlowes, Hemel Hempstead.—Application for discharge to be heard on May 15th at the Court House, St. Albans.

**T. F. Jarrett** (T. F. Jarrett & Co.), electrical engineer, 14, Springcopse Road, and 63, High Street, Reigate.—Trustees, Mr. H. G. Daniels, Market Hall, Redhill, and Mr. C. G. J. Silcock, Tudor Chambers, High Street, Reigate, appointed March 29th.

**E. Whitehouse,** electrical and radio engineer, 29, Westfield Street, St. Helens.—Last day for receiving proofs for dividend April 20th. Trustee, Mr. P. S. Booth, 2, Bixteth Street, Liverpool.

**L. Wardleworth** (L. & V. Wardleworth), radio and electrical engineer and contractor, 335, Bury Old Road, Prestwich.—Last day for receiving proofs for dividend, April 21st. Trustee, Mr. L. A. West, Byrom Street, Manchester, Senior Official Receiver.

**The bridal window display designed by E.D.A. for the current month**

**G. D. Whitham,** electrical engineer, 86, Orford Lane, Warrington.—Last day for receiving proofs for dividend, April 20th. Trustee, Mr. P. S. Booth, 2, Bixteth Street, Liverpool.

## Company Liquidations

**T. A. Beavon & Co., Ltd.,** Radio House, Wrexham, wireless factors.—The statutory meeting of the creditors was held on April 4th in Manchester, when the statement of affairs showed liabilities of £6,829, the net assets being £757, leaving a deficiency as regarded the creditors of £6,071. The company was incorporated on August 31st, 1931, with a nominal capital of £1,500, to take over a business previously carried on in partnership. The trading figures showed that during the twelve months to August, 1932, the turnover was £24,221, with a net profit of £85. During the year to August last the sales were £27,950, with a net loss of £1,051. That loss was explained by the directors as being due to the indisposition of Mr. Beavon and to the restriction of credit and to loss of discounts owing to lack of capital. During the period from August last to date the turnover was £11,723, and it was estimated that a loss had been sustained of £765. The fully secured creditors held as security a floating charge on the whole of the company's assets. The shareholders had passed a resolution for the voluntary liquidation of the company with Mr. A. Cripwell, Cherry Street, Birmingham, as liquidator. The creditors decided to confirm that appointment, and a committee of inspection was also elected, consisting of the representatives of Messrs. E. K. Cole, Ltd., the General Electric Co., Ltd., and A. C. Cossor, Ltd. The following are the principal creditors: McMichael Radio, Ltd., £114; Britannia Batteries, Ltd., £342; Siemens Electric Lamps & Supplies, Ltd., £176; E. K. Cole, Ltd., £920; A. C. Cossor, Ltd., £310; Cromwell, Ltd., £260; General Electric Co., Ltd., £770; Mullard Wireless, Ltd., £118.

**F. S. Mann, Ltd.,** radio manufacturers, Bangalore Street, Putney, S.W.—The statutory first meetings of the creditors and shareholders under the compulsory liquidation of this company were held last week at Carey Street, W.C., when the accounts showed a deficiency of £1,433 with regard to shareholders, the issued capital being £1,000. The company was formed in June, 1932, to take over the business of the Truphonic Radio Co. carried on by F. S. Mann and J. S. C. Hester. Mann disappeared in June, 1933, and Hester registered Truphonic Radio (Putney), Ltd., which bought up the assets of the old company and paid nearly all its debts. Hester attributes the failure of the company (F. S. Mann, Ltd.) to the prices charged for sets by Mann and to the action of the petitioning creditors (Marconi's Wireless Telegraph Co., Ltd.) in endeavouring to enforce an agreement which made it impossible to manufacture goods at competitive prices. The liquidation was left in the hands of the Official Receiver.

**Nash Products, Ltd.,** 514, Alum Rock Road, Birmingham, wireless and electrical dealers.—The statutory meeting of creditors was held recently when it was stated that the shareholders had passed a resolution nominating Mr. F. E. Bendall as liquidator. A statement of affairs as at March 24th, 1934, was submitted showing liabilities of £465 and net assets of £67—an estimated deficiency of £398. The position was attributed by the directors to the fact that in 1933 the company had to bear half the cost of replacing faulty material supplied by other firms in connection with battery-charging apparatus, as a result of which the company had to change its system of rectification and lost money in the transitional period. The creditors decided to confirm the voluntary liquidation with Mr. Bendall as liquidator.

## Private Arrangements

**Dayzite, Ltd.,** 19, Lisle Street, London, W.C., wireless and electrical factors.—A meeting of creditors was held on April 5th at the Institute of Chartered Accountants, Moorgate Place, E.C., when Mr. W. E. L. Day, the managing director of the company, presided. A statement of affairs was submitted, which disclosed liabilities of £11,099 and total assets of £3,734, leaving a deficiency of £7,364. Mr. Day said that some three years ago the company suffered severely owing to three burglaries. The turnover for 1931 was between £70,000 and £80,000. That figure, however, had been reduced to about £50,000 for the past twelve months. The company now had orders on hand for the delivery of between 200 and 300 radio sets, most of which would be paid for in cash. Those orders could not be carried out owing to non-delivery; one of the leading radio manufacturers had stopped supplying the company in December last. The company continued trading during the summer months at a loss in the hope that the winter trade would improve the position. Unfortunately the necessary supplies could not be obtained. Recently the position was gone into by the company and the five largest creditors, and it was agreed that the matter should be left in abeyance for a fortnight to see whether some scheme could be evolved which would be acceptable to the general body of creditors. The chairman said that assuming deliveries could be obtained in the future the company could offer the creditors 2s. 6d. in the £ in April, 2s. 6d. in the £ five months later, and 5s. in January, 1935. The other 10s. would have to be apportioned during 1935. It was resolved to appoint a committee consisting of the representatives of five of the largest creditors to inquire into the position further and to report to an adjourned meeting of creditors in fourteen days. The following are the principal creditors: Will Day, Ltd., £1,950; General Electric Co., Ltd., £1,350; Marconiphone Co., £986; Ferranti, Ltd., £835; E. K. Cole, Ltd., £537; Chloride Electrical Storage Co., Ltd., £261.

**F. Elton,** trading as the Wireless Service Depôt, 9, Eden Quay, Dublin, wireless and electrical dealer.—A meeting of the creditors in this matter was held recently at the offices of Messrs. C. Latham & Co., 78, New Oxford Street, London, W.C., when Mr. Porter, solicitor, of Dublin, presided.—A statement of affairs was submitted which disclosed liabilities of £1,909 and net assets of £800. It was reported that the debtor commenced business in May, 1929. According to a balance sheet prepared at March 31st, 1933, there was a deficiency of £64. The annual turnover had averaged £3,000. The gross profit during 1934 was £50, and the total net profit for the five years' trading was £867. In the same period debtor's drawings amounted to £1,712. It was decided that the creditors should agree to a deed of composition providing for the payment of 6s. in the £, in three equal instalments, the trustees appointed under the deed being Mr. C. Latham and Mr. Davy (Dublin). A committee of inspection was also appointed. The following are creditors: Baxendale & Co., Ltd., £170; Brown Bros. (Ireland), Ltd., £110; General Electric Co., Ltd., £121; Marconiphone, Ltd., £713; Portadyne Radio, Ltd., £218.

**F. Hurley,** 100, Charminster Road, Bournemouth, radio dealer and electrician.—At a recent meeting it was stated that the liabilities amounted to £240 with total assets of £107, leaving a deficiency of £133. Debtor had been in business for a number of years. The creditors agreed that a third party should be approached with a view to paying a composition of 7s. 6d. in the £, and failing this the estate is to be realised.

# Electricity Supply

## Lighting, Domestic, Power

**Belgian Congo.**—Electro-smelting.—In connection with the recently opened hydro-electric power station, the Société Geomines is considering the question of establishing in the Belgian Congo an electro-metallurgical works for the smelting of cassiterite, which has hitherto been shipped to Belgium in ore form.

**Bingley.**—Bulk Supply Change-over.—A change-over from 33-kV bulk supply from Keighley Corporation to a direct supply from the Yorkshire Electric Power Co. was brought into effect at midnight on March 31st, thus terminating a twenty years' agreement between the Urban District Council and the Corporation, four miles away. The change has necessitated the addition of a sub-station adjoining the existing works at Bingley, together with the installation of two transformers of larger capacity. The whole of the cost of the extra equipment has been defrayed by the Yorkshire Electric Power Co. The formal inauguration of the new service was performed on April 5th by Councillor A. R. Bentley, J.P. (chairman of the Bingley U.D.C.). The chairman (Mr. R. Armitage) and directors of the power company subsequently entertained the assembly at luncheon, and in the course of the speeches reference was made to the protracted negotiations for new terms which had proceeded between Bingley and Keighley as the time of expiry of the existing agreement approached. Better terms had been secured from the Yorkshire Electric Power Co. than had obtained under the old agreement. Secondly, Bingley had obtained an almost unlimited supply, whereas the existing overhead lines were practically fully loaded. Thirdly, the power company had assisted greatly by installing the extra plant free of cost to the local Council. Fourthly, they had now pressure control at their own works, which was a decided advantage. During the past two years over 1,100 new consumers had been connected to the Bingley system; the kWh sold had increased from 3,000,000 to over 4,000,000; the showroom cash sales had increased by £100 this year, and the value of the hire-purchase sales had advanced from £1,024 in 1933 to £2,135 to date.

**Blackpool.**—Price Reductions.—The reduction in electricity charges for new areas incorporated in the Blackpool district will cost the town's electricity undertaking £12,150 per annum. The Electricity Committee recently reduced the flat rate tariff, and following the extension of boundaries there was a reduction equal to over 8 per cent. in the tariffs paid by consumers in the areas recently added to the borough.

Loans.—The Electricity Committee is seeking sanction to borrow £24,000 for new electrical services to meet the next three years' requirements.

**Bolsover.**—Loans.—The Urban Council seeks sanction to borrow £2,000 for mains and services, £1,500 for meters, and £2,000 for wiring installations.

**Bonhill (Dumbartonshire).**—Supply Proposal.—The Clyde Valley Electrical Power Company has received permission to install electric light in a number of houses in the district.

**Bridge of Weir.**—Street Lighting.—After a three months' experiment it has been decided to fit bi-multi-reflectors to seventy electric standards in the main streets.

**Bridlington.**—Bulk Supply.—The Town Council has decided to offer a bulk supply to the Buckrose Light & Power Co., Ltd., in order to enable the company to distribute supplies to the villages of Buckton and Bempton, on the same terms and conditions as for the bulk supply being given to the company for Flamborough.

**Bulgaria.**—Electrical Progress.—The report of the Compagnie d'Electricité de Sofia et du Bulgarie shows that the sales of power during last year reached a total of 34,133,875 kWh, as compared with 32,903,458 kWh in 1932 and 30,107,915 kWh in 1931. The number of consumers advanced from 45,992 to 49,852 in 1932, and by the end of last year to 54,545. The company's distributing system comprises about 25 miles of 35,000-V lines, 25 miles of 6-7,000-V lines, 60 miles of 7,000-V underground mains, and 430 miles of low-voltage mains.

**Canada.**—Electricity in Mining.—During 1932 the mining industry had 520,638 h.p. of plant, of which electric motors represented 392,826 h.p. 313,567 h.p. of electricity was purchased and 79,259 h.p. was generated by the industry itself. Thus electric power represented 75.5 per cent. of the total power employed, while 83.1 per cent. of the motive power used for metal mining was electric.

**Cardiff.**—School Heating.—The Electricity Committee is offering a flat rate of ¾d. per kWh throughout the year for energy supplied for heating public and private schools using electricity exclusively for that purpose.

**Carlisle.**—Loans.—The Electricity Committee is seeking sanction to borrow £5,000 for an assisted-wiring scheme, £5,000 for mains, and £5,000 for sub-stations.

**Chester.**—Bulk Supply Rejected.—An application by the Town Council for permission to give a bulk supply to the Hawarden Rural Council has been rejected by the Electricity Commissioners. Agreements have been entered into with the Chester Rural Council for public lighting by electricity at Hoole Village, Christleton, and Blacon.

**Dover.**—Loan.—The borrowing of £7,920 for mains and sub-station equipment has been sanctioned. The Minister of Transport has approved of the erection of overhead lines in the parishes of St. Margarets-at-Cliffe and Temple Ewell. The number of consumers has grown by 3,500 to a total of 7,500 in ten years.

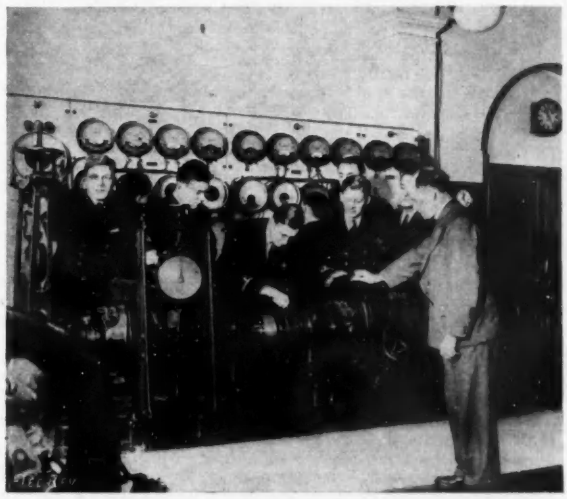
Messrs. A. Hugh Seabrook & Partners, consulting engineers, have inquired whether the Corporation is disposed to sell its undertaking. Two years ago an offer from the South-East Kent Electric Power Co. was declined.

**East Carlton.**—Overhead-line Objection Withdrawn.—The Kettering Rural Council has withdrawn its former objection to the erection by Kettering Urban Council Electricity Department of overhead wires in connection with an electricity supply to East Carlton. Messrs. Stewarts and Lloyds factory building operations have made the supply possible.

**East Grinstead.**—Mercury Rectifiers.—The Urban Council is to expend £4,000 on continuing the d.c. system in the centre of the town by the installation of mercury-arc rectifiers.

**East Ham.**—Street Lighting.—The borough engineer has prepared a scheme for improved lighting in High Street North at a cost of £1,380.

**Enfield.**—Stand-by Supply for Pumping.—When a recent sub-station failure interrupted the North Metropolitan E.P.S. Co.'s supply to the Brimsdown pumping station the pumps were kept going with electricity furnished by the Ruberoid Co., Ltd., from its private generating plant. The Urban District Council is now considering the installation of apparatus to maintain this arrangement in the event of future emergencies.



**Students at work in the Physics Department of the Royal Naval College, Greenwich, where there is a good collection of electrical plant**

**France.**—New Hydro-electric Station.—La Société des Fonderies et Aciéries Electriques, of Aix-les-Bains, has lately secured a concession to establish a hydro-electric generating station to utilise certain falls on the River Arc near Aiguebelle in the Savoy Department.

**Hampstead.**—New Sub-station.—The Finchley Council is to seek sanction to an £11,600 loan required for a sub-station and plant at Hampstead Garden Suburb.

**Iceland.**—Hydro-electric Works.—It is reported from Reykjavik that the Parliament has decided to raise a loan of 7,000,000 kr. for the establishment of an electricity supply works in the Thingvallasjons course of the River Sog.

**Johnstone.**—House Wiring.—At last meeting of the Corporation a Housing Committee recommendation not to install electric light in a housing scheme was objected to, members contending that the sensible thing was to have the houses wired now. The recommendation was taken back.

**Keighley.**—Mains Extensions.—The Electricity Committee is to extend mains and provide sub-stations at a cost of £5,236.

Price Reduction.—During the summer half-year electricity used for cookers and wash-boilers is to be charged for at the reduced rate of ½d. per kWh.

**Kirkcaldy (Fife).**—Bulk Supply.—The Corporation is recommended by the Transport and Electricity Committee to accept the offer of the Central Electricity Board to provide a bulk supply.

**Latvia.**—New Power Station.—A *Reuter* message from Riga says that negotiations with foreign firms for the construction of the Daugava (Duna) hydro-electric power station not having produced any definite result, it has now been decided to explore the possibility of utilising Latvian resources for the purpose. The Budget Commission has entrusted competent ministers with the task of drawing up immediately a plan for starting work on the station financing the scheme from unemployment funds.

**Liverpool.**—Loan for Mains Extension.—Borrowing powers for £300,000 are being sought by the Electric Power and Lighting Committee for extensions to mains, underground and overhead.

MAINS EXTENSIONS.—Authority has been granted to the Electric Power and Lighting Committee for the extension of 33,000-V and 6,000-V mains in the city area at a total estimated cost of £11,282. Application has been made to the Commissioners for an Order to enable the Corporation to give supplies of electricity to premises in Huyton, Melling, and Tarbock.

**London.**—BATTERSEA.—Price reductions have been made which will represent an annual saving of £19,000 to domestic, business, and power consumers, while the reduction of street lighting charges will save £751 per year.

**Maidstone.**—STREET LIGHTING.—The Town Council is to have the lighting in London Road improved at a cost of £1,069.

MAINS EXTENSION.—The main in the Well Street area, East Malling, is to be extended at an estimated cost of £320, in the Tonbridge Road, in view of building developments at Barming House (estimated cost £300); a loop main is to be laid between Aylesford and Ditton (£335), and application is to be made for a Fringe Order to supply premises at Nettlestead.

**Manchester.**—LOANS.—The Electricity Committee has obtained sanction to borrow £100,000 for electricity services, and £264,200 for transformers and switchgear.

**Mansfield.**—EXTENSIONS.—The Electricity Committee is to provide a h.p. feeder, sub-station, and l.p. distributing mains in the neighbourhood of Bath Lane at an estimated cost of £4,771.

**Mexico.**—PRICE REDUCTIONS.—The Mexican Department of National Economy has recently taken up the question of electric light and power rates, and in some instances has issued notices calling for lower charges. The powers of the Federal Government over generating companies were recently confirmed by a constitutional amendment. The President has also been authorised to establish a National Electrical Commission, part of the duties of which will be to examine light and power rates and compel reductions when it considers that the prevailing charges are too high.

**Newhaven.**—REDUCED PRICES.—The Newhaven and Seaford Electricity Co., Ltd., has reduced charges in its urban areas for domestic and industrial power and heating to 1½d. per kWh, and in the remainder of the area of supply to 1¾d. The domestic two-part tariff "unit" charge has been reduced to ¾d. and 1d. in the two sections of the area respectively and the business two-part "unit" charge to 1d. and 1¼d.

**Northern Ireland.**—COOKSTOWN.—The Board has taken over the Cookstown Gas, Electric Light and Power Company's undertaking, which it acquired in March. Mr. George Hanna, who was manager for the company, will supervise the local plant, which will continue to supply the town until the Board's new transmission line reaches Cookstown, when the supply will be changed over from d.c. to the Board's a.c. system.

BALLYCASTLE.—As a result of the recent inquiry into the application of consumers for a revision of the charges made by the Ballycastle Electric Light & Power Co., Ltd., the Northern Ireland Ministry of Commerce has issued an Order lowering the maximum charges, the revised scale to operate from April 1st.

BELFAST.—The Corporation is applying for permission to alter the system of supply in the north-east portion of the city from 440/220-V d.c. to 220-V, three-phase, 50-cycle a.c.

**Oxford.**—LOAN FOR METERS.—The Electricity Committee has obtained sanction to a loan of £10,000 for the purchase of meters.

**Portsmouth.**—BULK SUPPLY CHARGES.—The Electricity Committee has had under consideration an application from the Fareham Urban District Council for a revision of the charges applicable to the bulk supply to that Council, and recommends that as from the date when its consumption exceeds 1,000,000 kWh the charges should be amended to conform to the scale applicable to the Chichester Corporation, namely, for all energy in excess of 1,000,000 kWh per annum, the price per kWh to be reduced by 10 per cent.

NEW OFF-PEAK CHARGE.—The charge of 0.33d. per kWh for electricity used for night heating purposes is to be reduced to 0.25d. per kWh.

**Ramsgate.**—ELECTRICITY IN COUNCIL HOUSES.—The Town Council has decided to raise no objection to the installation of electricity in Council houses by the Ramsgate & District Electric Supply Co., Ltd., on the understanding that no municipal expense is to be incurred. Last December the Council refused a similar application made by the company.

**Redcar.**—FURTHER REDUCTIONS.—Another 5 per cent. reduction recommended will make the charge for lighting 3.8d. and for power 1¾d. per kWh, less 5 per cent. for the first 100 kWh. For all energy above 100 kWh the net charge will be one penny.

**Ripon.**—ELECTRICITY IN GAS WORKS.—The Highways Committee has decided to replace the steam pumps at the gasworks by electrically driven pumps at a cost of £150.

**Rotherham.**—FRINGE ORDER.—The Electricity Committee is to seek a fringe order to supply houses in the Wath-on-Dearne area.

**St. Austell.**—REDUCTION ON EXTENSION OF TENURE.—The Electric Light Co. has informed the Urban Council that it is prepared to make an immediate reduction in charges on an assurance that the authorities concerned are prepared to support an immediate application by the company for an extension of its order; the Council proposes to request the Electricity Commissioners to hold an inquiry into the charges made for electricity.

**Sale.**—GAS OFFER DECLINED.—The Council has declined the offer of the Stretford Gas Board to install gas lighting for a trial period in the main road free of cost to the Council.

**Shap.**—STREET LIGHTING.—Electricity for street lighting is to be installed in the urban district and the work is being carried out by the Westmorland & District Electricity Supply Co., Ltd., a subsidiary of Messrs. Johnson & Phillips, Ltd.

**South Africa.**—WORCESTER (CAPE PROVINCE).—The Town Council has decided to seek the assent of the ratepayers to a loan of £16,750 for extensions to the power station. Mr. F. C. D. Mann, the municipal electrical engineer, has reported that the power station is now carrying its maximum load. The extension scheme has already been sanctioned by the Electricity Supply Commission.

KROONSTAD.—The Council has successfully raised a loan with which to pay for the new power station and alternating-current scheme, which will cost £60,000. Orders for the machinery and plant have been placed in the proportions of 45 per cent. British, 45 per cent. German, and 10 per cent. Swedish.

**Southport.**—STREET LIGHTING.—The Lighting Committee has instructed the borough electrical engineer to light Lord Street with lanterns, on fifty-one new standards, fitted with gasfilled lamps, at a cost of £1,975, and the promenade with decorative lanterns at a cost of £505.

RATE AID.—The Finance Committee has requested the Electricity Committee to make a contribution of £3,800 to the expenditure of the Corporation during the ensuing financial year.

**South Shields.**—STREET LIGHTING.—The Town Council is to spend £200 on the lighting of Westoe Road with "Osira" lamps.

**Startforth (Yorks).**—NEW SUPPLY.—The Rural Council has approved a plan submitted by the North Eastern Electric Supply Co., Ltd., for supplying electricity to Lartington.

**Tanfield.**—MAINS EXTENSIONS.—The Urban District Council proposes to expend £1,260 on the erection of h.p. lines and sub-stations at Burnopfield and £1,070 on similar work in the South Ward.

**Wallasey.**—MAINS EXTENSIONS.—The Electricity Committee has decided to lay low- and high-voltage mains in various thoroughfares at an estimated cost of £3,570.

**West Bromwich.**—PRICE REDUCTION.—The Electricity Committee recommends the reduction of the flat rate from 7d. to 6d. per kWh.

**West Lothian.**—ARCRECTIFIER.—The County Council has considered a report by Mr. Alex Brown, the engineer, to Uphall Lighting Committee, recommending the installation of a Bruce Peebles 150-kW mercury arc rectifier equipment. It would be necessary to arrange with the Scottish Central Electric Power Co. to alter the position of its 6,000-V oil switch in the sub-station so as to provide space for the Committee's 20,000-V switch panel. There was also submitted a plan of the proposed additional plant and an offer by Bruce Peebles & Co., Ltd., to supply it for £1,060 with a sum of £85, being the extra price for manually operated grid control for voltage regulation. The Committee accepted the offer.

**Wilton.**—OVERHEAD LINES.—The Wessex Electricity Co. has presented to the Rural Council plans for an extension of overhead cables at Wylye. The positions of the poles have been approved by the Wiltshire branch of the Society for the Preservation of Rural England, and the Council has approached the company regarding the extension of the cables along the Chalk Valley.

**Winchester.**—ENCOURAGING DOMESTIC USE.—With the object of encouraging the further use of electricity for cooking and water heating, the "unit" charge under the two-part tariffs for private residences and business premises has been reduced for the period April 1st to September 30th in each year from 1d. to ¾d. in the city area, and from 1½d. to 1d. in the rural area.

**Wolverhampton.**—SYSTEM CHANGE-OVER.—The Electricity Committee is to change over the supply in the Heath Town and Park Village areas at a cost of £5,375. Mains are to be extended at a cost of £6,953 to the Wolverhampton Die Castings Co., Graisley Hill; Bushbury Hill; Woodlands Farm, Weston-under-Lizard; and to the Derry Street and Cannock Road housing estates.

**Worksop.**—BULK SUPPLY.—The Urban District Council has received inquiries for the supply of electricity for new industries, but, according to the borough electrical engineer, the Central Electricity Board is unwilling to tap the grid for the purpose. It has intimated that Worksop's future supply should be *via* the Derby & Notts Power Co., to which the Council will not agree, maintaining that it can produce energy more cheaply by local generation.

**Worthing.**—NEW SUB-STATIONS.—The Electricity Committee has prepared a scheme for the erection of sub-stations, &c., at a cost of £12,453.

**Wrotham.**—NEW SUPPLY.—The Kent Electric Power Co. has decided to provide a supply of electricity to the Plaxtol district of Wrotham.

# Traction

**Carlisle.**—TRAFFIC SIGNALS.—The city electrical engineer has received a complaint from the Post Office Engineering Department concerning interference with wireless reception in the neighbourhood of the Blencowe Street traffic signals, due to the operation of the lamp contactors. The Corporation Highways Committee has decided that suitable non-interference units shall be fitted to the signals in question.

**Darwen.**—TROLLEY-BUSES.—The Transport Committee is again considering substituting a trolley-bus service for tramcars on the Bolton road section. The idea of the promoters is that it would be cheaper to run this type of vehicle between the Circus and Whitehall than to maintain the tramway track.

RATE RELIEF.—During last municipal year the Transport Department earned a net profit of £2,000, or £5,000 more than estimated; of this amount £1,300 went to relief of rates.

**Macclesfield.**—ELECTRIC VEHICLES.—A good example is being set by the Electricity Co. of Macclesfield, Ltd., which is employing a battery-driven van for delivering electrical appliances to consumers. The vehicle was built by Electricars, Ltd., is of 10-12-cwt. capacity, and is fitted with a battery of thirty "Exide-Ironclad" cells, IMV.5 type, of 161-Ah capacity at the five-hour rate.

**Middlesex.**—STREET TRAFFIC SIGNALS.—Vehicle-actuated road crossing indicator lamps are to be installed at twenty-one further points in the county, and the provision of sets of signals at other crossings is under consideration. The districts in which the new installations are to be erected include Acton, Brentford and Chiswick, Ealing, Edmonton, Enfield, Finchley, Hendon Borough, Hendon Rural, Heston and Isleworth, Hornsey, Southall-Norwood, Southgate, Teddington, Tottenham, Willesden, and Wood Green, says *The Times*. The cost of the scheme is estimated at about £10,000, towards which it is expected that the Ministry of Transport will grant 60 per cent. Most of the signals already at work in various parts of the county are of the vehicle-actuated type, and those to be added will be of the same pattern. On the important by-pass roads, especially, the signals are proving an important factor in reducing the possibility of accidents at what were formerly considered dangerous crossings, and also in relieving traffic congestion. It is stated that the few existing fixed-time signals at work will probably be converted into vehicle-actuated signals at an early date.

**Northern Ireland.**—BELFAST.—A sum of £22,500 is to be spent on reconditioning about 100 tramcars of the Corporation's system. It is reported that the work is to be carried out by a local firm. At one time it was thought that more motor buses would be purchased and the tramway system curtailed in certain parts of the city.

**Portsmouth.**—TRACK RECONSTRUCTION.—The Corporation Transport Committee recommends the reconstruction of the tramway track between St. Mary's Road and New Road at a cost of £5,840.

**Switzerland.**—FURTHER ELECTRIFICATION.—Operations have just been commenced on the electrification of two further sections of the Swiss Federal Railways, one between Bienne and La Chaux-de-Fonds, and one between Buchs and St. Margrethen (St. Gall Canton).

# Communications

**France.**—NEW "ANTI-INTERFERENCE" LAW.—A new law has come into force which compels manufacturers to fit "anti-interference" devices to all electrical apparatus capable of distorting wireless reception. A long list of apparatus has been specified as requiring the incorporation of such devices, including wireless sets themselves. The law does not define what constitutes an "anti-interference" device, but all apparatus affected by it must be suitably equipped by July.—*Reuter* (Paris).

**Glasgow.**—LOUD SPEAKERS.—A Parliamentary Commission which has been inquiring into the terms of a Provisional Order promoted by the Corporation has allowed the inclusion of powers to regulate and control the use of loud speakers, etc.

**Great Britain.**—RADIO LICENCES.—There was a net increase of 67,755 broadcast radio receiving licences in February, making totals of 5,639,000 in England and Wales, 457,000 in Scotland, and 57,000 in Northern Ireland. Including the 38,950 free licences issued to blind people, the aggregate was thus 6,191,950, representing an increase of 766,400 in twelve months.

RADIO RELAY SERVICES.—Gwalia Radio Relay Services is forming a subsidiary company to deal with the Llanelly borough and rural area relay.

A special committee appointed by the Ilford Council has reported in favour of negotiation with relay companies.

The Portsmouth Corporation has passed plans submitted by Hants Relay, Ltd., for the erection of a sub-station at Southampton Road, Cosham.

The Pontefract Council has rejected two applications for concessions.

The Tunbridge Wells Town Council has refused an application by Wireless Services, Ltd., for permission to install a service in the borough. The Corporation, it was stated, had no legal power to give any one company a monopoly.

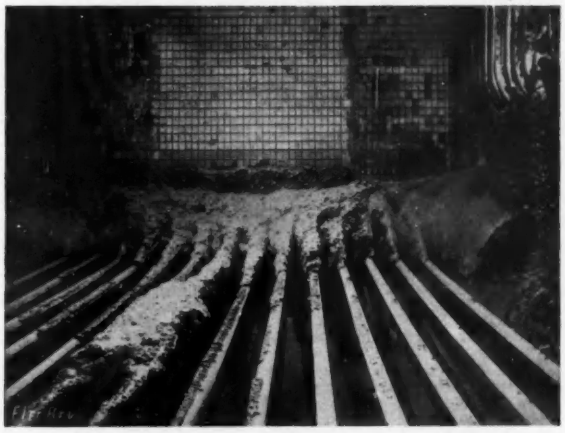
The Bootle Corporation Highways Committee has refused a request of Wireless Services, Ltd., that the reduced royalty payable to the Corporation by the company should be operative as from March 1st, 1933, in lieu of March 1st, 1934.

The Barrow-in-Furness Estates Committee has granted K.L.M. Radio Relays, Ltd., permission to install services in houses on the Roosegate estate. An application for permission to provide a service on Walney Island was not granted.

The Blackpool Highways Committee has deferred a further application from Mr. Oswald B. Kellett, on behalf of several operators, for reconsideration of their proposal to establish services in the borough.

**India.**—NEW TELEPHONE CIRCUIT APPROVED.—The Standing Finance Committee of the Indian Legislative Assembly has approved the construction of a telephone trunk circuit between Patna and Muzaffarpur.

**Liverpool.**—MAINS BROADCASTING.—Members of the Standing Committee of the House of Commons which is considering an Electricity (Supply) Bill, a proposed amendment of which is designed to give local authorities power to utilise their elec-



**The radiant-heat superheater in No. 4 Boiler at Brimsdown "B" station. (See page 519)**

tricity supply mains for the relaying of broadcast wireless programmes, witnessed a demonstration of the method last week in which the Liverpool Corporation Electricity Department and British Insulated Cables, Ltd., co-operated. Mr. P. P. Eckersley, formerly chief engineer of the B.B.C., has been concerned with the development of the system, to which attention will be drawn at the end of May when the I.M.E.A. Convention is held at Liverpool. Mr. Eckersley touches upon the general question in his paper dealt with in this issue.

**London.**—B.B.C. FINANCE.—The allocation to be made by the Post Office this year to the British Broadcasting Corporation will amount to £1,950,000, of which the Corporation will forgo £250,000 by way of an "emergency" contribution to the Exchequer. The B.B.C. will thus receive £182,000 more than it did last year.

**North America.**—CABLE RATES.—The sudden abolition in January of the special rates in the telegraph service between this country and North America has received considerable attention in financial and business circles. The resultant increase in message cost, over 50 per cent. in some cases, has caused traffic to decline. A committee representative of the principal cable users has made representations to the International Telegraph Companies' Association, but so far with inconclusive results. It is in close touch with a similar body called the Radio and Cable Users' Protective Committee which has been formed in New York, and it has now been decided to approach the Imperial Communications Advisory Committee. Meanwhile Imperial & International Communications, Ltd., which has not hitherto catered specially for the rush traffic between the London and New York Stock Exchanges, is to open a new office in London.

**Poland.**—BROADCASTING DEVELOPMENT.—Registered listeners increased by 4,594 during February last to a total of 327,562. The reconstruction of the Poznan station has been completed and the new Marconi transmitting plant is radiating a full programme on a wavelength of 345.6 m., with a power of 16 kW. It is proposed to build a new station at Torun, the capital of Polish Pomerania. The plant is to be of Polish construction entirely. Workshops are being established on the premises of the reserve transmitter of Warsaw II in Mokotow, a suburb of Warsaw, with the advice and co-operation of the State Laboratory of the Tele-communication Institute. The station's power will be 24-30 kW, and it is to be completed by the end of the year.

**Worthing.**—COUNCIL HOUSE AERIALS.—The Corporation Town Planning Committee has decided not to require an annual acknowledgment of 1s. in respect of each wireless aerial installed in Council houses. The consent of the Committee will, however, have to be obtained in every case.

# Contract Information

*When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below*

## Contracts Open

**Ardrossan** (Ayrshire).—April 16th. Town Council. Various works, including electric lighting, at eighty-four houses. Specifications (£1 1s.) from, and tenders to, Joint Town Clerks, Burgh Chambers.

**Australia.**—(Brisbane).—June 8th. City Council. Traction sub-station equipment. (A.Y. 12283.)*

Melbourne.—April 24th. Posts and Telegraphs Department. Telephone transformers. (A.Y. 12319.)*

June 26th. Battery and magneto P.B.X. cordless type, table pattern telephone switchboards. (A.Y. 12317.)*

**Caithness.**—April 23rd. County Council Education Committee. Various works, including heating and electrical, at new school at Lybster. Schedules from architects, Messrs. Sinclair Macdonald & Son, Wick and Thurso (deposit £2 2s.); tenders to D. W. Georgeson, clerk to the Education Committee, Wick.

**Cardiff.**—April 23rd. Electricity Department. E.h.p. and l.p. switchgear and e.h.p. and l.p. cables. (April 6th.)

**Cleethorpes.**—April 30th. U.D.C. One 250-kW transformer, e.h.p. switchgear and cable. (See this issue.)

**Dartford.**—April 27th. Corporation. Cable. (See this issue.)

**Dagenham.**—April 27th. U.D.C. Electrical wiring, fittings, &c., at the new branch library. (April 6th.)

**Dover.**—April 18th. Corporation. Cable, distribution lines, &c. (March 23rd.)

**Dumfries.**—April 20th. County Council. Various works, including electric lighting installations, at housing scheme. Schedules from, and tenders to, County Clerk, County Buildings.

**Dunfermline.**—April 23rd. Town Council. Various works, including electric lighting, at forty-four houses at Baldridgeburn. Schedules from Mr. D. H. Shaw, burgh engineer, City Chambers (deposit £1 1s.); tenders to Town Clerk.

**Glasgow.**—April 19th. Corporation. Various works, including heating and electrical work, at police training centre, Nicholson and Oxford Streets. Schedules, &c., from Master of Works Department, City Chambers (Room 81) (deposit 2 guineas); tenders to Town Clerk.

April 23rd. Lighting Department. Materials for one year, including electrical fittings and accessories. Specifications from 20, Trongate; offers to Town Clerk.

**Halifax.**—April 14th. Corporation. Traffic control signals. (March 30th.)

**India.**—Travancore.—June 4th. Government Electricity Department. Turbines, generators, switchgear, transformers, &c. (February 9th.) Date extended from May 7th.

New Delhi.—April 23rd. Indian Stores Department. 7,500 yds. three-core paper-insulated lead-covered cable. (A.Y. 12302.)*

Simla.—May 10th. Indian Stores Department. Five oil-cooled power transformers. (A.Y. 12305.)*

**London.**—H.M. Office of Works. May 8th. Supply of mechanical and electrical engineering labour in the Newcastle-on-Tyne, Leeds and Southampton districts for three years. (See this issue.)

**Manchester.**—April 23rd. Electricity Committee. Transformers, meters, kettles, time switches, a.c. motors, cables, and service cut-outs for twelve months. (See this issue.)

**New Zealand.**—Wellington.—Posts and Telegraphs Department. April 18th. 1,000 switchboard plugs and 2,500 24-V switchboard lamps. (A.Y. 12218.)*

April 30th. Eighteen double-pole, single-throw contactors. (A.Y. 12250.)*

May 7th. Thirty-seven moving-coil milliammeters and one voltmeter. (A.Y. 172272.)*

Public Works Department. May 29th. One 33-kV oil-immersed circuit-breaker. (A.Y. 12276.)* Three single-phase potential transformers. (A.Y. 12274.)*

June 26th. Battery-charging equipment. (A.Y. 12273.)*

May 8th. 6-V secondary batteries. (A.Y. 12244.)*

May 1st. Transformer oil drying and testing apparatus. (A.Y. 12252.)*

May 22nd. Battery-charging equipment.(A.Y. 12249.)*

June 5th. 50-V storage battery and charging equipment. (A.Y. 12245.)*

May 8th. Three 63,500/63.5-V oil-immersed self-cooled transformers. (A.Y. 12303.)*

**Northern Ireland.**—Belfast.—April 17th. Board of Guardians. Electric heating, lighting and passenger-lift installations in new Maternity Hospital. Clerk of Union, Lisburn Road, Belfast (deposit £2 2s. each specification).

**South Africa.**—Cape Town.—April 18th. Electricity Department. Power and telephone cables. (A.Y. 12299.)*

Johannesburg.—April 19th. City Council. Two 400-kVA transformers. (A.Y. 12297.)*

Pretoria.—May 4th. Government Supplies Board. Four-cord circuit repeaters. (A.Y. 12298.)*

Lead-covered underground telephone cables. (A.Y. 12306.)*

**Southampton.**—April 24th. Electricity Department. 2,000-kW rotary convertor, complete with transformer, starting panel, &c. (See this issue.)

**South Shields.**—May 2nd. Electricity Supply Department. One 1,000-kW rotary convertor complete with transformer and switchgear. (See this issue.)

**Taunton.**—May 11th. Electricity Department. One 3,750-kW turbo-alternator and one 25,000-lb. water tube boiler. (See this issue.)

**Warrington.**—April 16th. Electricity Department. Transformers. (March 30th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

## Contracts Closed

**Barrow-in-Furness.**—Highways Committee. Accepted. Two 2-ton electric vehicles (£1,280).—General Vehicle Co., Ltd.

**Birkenhead.**—Electricity Committee. Accepted. Cable testing set (£253).—Ferranti, Ltd. Wiring installations under assisted scheme: twenty-one houses (£81), L. W. Bryan; twenty-one houses (£97), Economic Electric Co.; seven houses (£27), S. George; seventy-three houses (£307), Park Electric Co.

Welfare Committee. Accepted. Electric lighting and heating at clinic (£90).—Economic Electric Co., Ltd.

**Dewsbury.**—Housing Committee. Accepted. Wiring seventy Council houses on three estates (£380), W. Angus.

**Doncaster.**—Town Council. Accepted. Electric light wiring at the Grey Friars Road baths, M. S. Milan. Removal of the existing power line adjoining the aerodrome and replacement by an underground cable (£2,879).—Enfield Cable Works, Ltd.

**Dumfries.**—Corporation. Accepted. Kiosk and transformer (£199).—Metropolitan-Vickers Electrical Co., Ltd.

**Eastbourne.**—Electricity Committee. Accepted. Cable.—Craigpark Cable Co.; Standard Telephones & Cables, Ltd.

**Gravesend.**—Electricity Committee. Accepted. Kiosk (£148).—Standard Switchgear Co., Ltd.

**Liverpool.**—Electric Power and Lighting Committee. Accepted. Six 1,000-kVA transformers (£312 each).—English Electric Co., Ltd. Eighteen 750-kVA transformers (£241 each).—Metropolitan-Vickers Electrical Co., Ltd.

**Maidstone.**—Town Council. Accepted. One 400-kW glass-bulb rectifier (£1,790).—Hewittic Electric Co., Ltd. One 750-kW steel-clad rectifier (£2,894).—General Electric Co., Ltd.

**Maidenhead.**—Town Council. Accepted. Cleaning out a battery and supplying and erecting new positive plates with wood separators (£374, less amount allowed for material recovered).—D.P. Battery Co., Ltd.

**Newcastle-on-Tyne.**—City Council. Accepted. Installation of an internal telephone and fire alarm system in the Grange Hospital and the General Hospital (£881).—Automatic Electric Co., Ltd.

**Oxford.**—Watch Committee. Accepted. Traffic signals at Carfax (£449).—Automatic Electric Co., Ltd.

**Portsmouth.**—Watch Committee. Accepted. Automatic traffic signals at two road junctions (£689), Siemens & General Electric Railway Signal Co., Ltd..

Electricity Committee. Accepted. Switchgear alterations at power station (£650), and switchboard extension at Purbrook sub-station (£169).—English Electric Co., Ltd. L.p. feeder regulator (£196).—Hackbridge Electric Construction Co., Ltd. Four cast iron feeder pillars (£73).—W. T. Henley's Telegraph Works Co., Ltd. Meter boards (£353).—Wootton & Co., Ltd. Service cut-outs (£982).—British Insulated Cables, Ltd. Service boxes J. Shervell, Ltd. (£1,758) G. Cash & Co. (£258). Cable.—Hackbridge Cable Co., Ltd.; Johnson & Phillips, Ltd.; Edison Swan Cables, Ltd.

**Renfrew.**—Town Council. Accepted. Wiring and fitting of sixty-eight houses to be erected at Portefield Road (£298).—Colquhoun and McArthur.

**Rotherham.**—Electricity Committee. Recommended. Transformers for twelve months.—General Electric Co., Ltd. Switchgear for twelve months.—A. Reyrolle & Co., Ltd.

**Warrington.**—Electricity Committee. Accepted. Additional switch cubicle and panel.—British Thomson-Houston Co., Ltd. Additional switch panel.—Ferguson, Pailin, Ltd.

**York.**—Electricity Committee. Recommended. Overhead line to Marton.—Johnson & Phillips, Ltd.

## Forthcoming Events

**Institution of Electrical Engineers.**—(*Meter and Instrument Section*).—Friday, April 13th. Institution, London. 7 p.m. "Experience with, and Problems Relating to, Bottom Bearings of Electricity Meters." Mr. G. F. Shotter. (*Irish Centre*).—Friday, April 13th. Gaiety Theatre, Dublin. 4 p.m. Faraday lecture. "The Electrical Engineer and the Free Electron." Mr. C. C. Paterson. (*London Students' Section*).—Saturday, April 14th. 2 p.m. Visit to the Royal and Monument Telephone Exchanges. (*Tees-Side Sub-Centre*).—Monday, April 16th. Cleveland Technical Institute, Middlesbrough. 7 p.m. Annual general meeting. (*Western Centre*).—Monday, April 16th. Gloucester. "The Lower-Voltage Sections of the British Grid System." Mr. C. W. Marshall. (*North-Western Students' Section*).—Tuesday, April 17th. Engineers' Club, Manchester. 7.15 p.m. Annual meeting. "The Induction Meter." Mr. M. Whitehead. (*Sheffield Sub-Centre*).—Wednesday, April 18th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "The most Recent Development in Electric Traction." Mr. G. H. Fletcher.

**Electrodepositors' Technical Society** (*Midlands Centre*).—Tuesday, April 17th. James Watt Memorial Institute, Birmingham. 7.30 p.m. "The Electrodeposition of the Platinum Metals." Messrs. R. H. Atkinson and A. R. Raper.

**Institution of Engineers-in-Charge.**—Wednesday, April 18th. St. Bride's Institute, London. 7.30 p.m. "Modern Electrical Equipment for Industrial Purposes." Mr. Mortimer.

**Telephone Development Association.**—Tuesday, April 17th. Grosvenor House, W. 7.30 for 8 p.m. "Telephone Service" dinner.

**Electrical Association for Women.**—April 19th and 20th. London. Ninth annual conference.

**Birmingham Electric Club.**—Friday, April 20th. Grand Hotel, Birmingham. 7 p.m. "Modern Broadcast Receiving Valves." Mr. F. E. Henderson.

**Bristol Electric Club.**—Friday, April 20th. Royal Hotel, Bristol. 6.30 p.m. Annual meeting.

# Notes

## High-voltage Alternator Insulation

Methods of constructing high-speed steam turbine driven alternators which have enabled the voltage generated to be raised very considerably without submitting the conductor insulation to any greater stresses than those recognised as conservative in 6.6- to 11-kV machines are dealt with in the paper by Mr. J. Rosen, recently read before the Junior Institution of Engineers in London. In the Battersea station there are 12,500-V machines and at Dunston there is a 13,500-V set, while several 22-kV machines have been installed in the United States. The adoption of the concentric conductor by C. A. Parsons & Co., Ltd., removed many limitations and enabled a 25,000-kW machine to be built for from 33 to 36 kV working voltage. This set has been in operation for six years at Brimsdown, and there are eight sets of this type in service or under construction with an aggregate capacity of 188,750 kW.

Amongst the practical and economic advantages claimed for the high-voltage alternator an important item was the saving of money and space due to the elimination of step-up transformers and the simplification consequent upon the reduction in the size and number of the cables to be brought out from the machine. The author stated that the next few years would almost certainly see a demand for turbo alternators to generate at 66,000 V. Very little information had been published about the behaviour of micanite, particularly under impulse or surge conditions. Moulded micanite, made up with varnish having a shellac base withstood the permanent application of high voltages as effectively as the flexible insulation made up with an oil base, but the latter had superior self-heating properties at impulse or commercial frequencies and would also withstand a series of impulse stresses better than the moulded material.

## I.E.E. Meter Section Summer Visit

The one-day summer visit of the Meter and Instrument Section of the Institution of Electrical Engineers will take place on May 5th. Members will travel by train to Birmingham, where they will visit the Corporation's Water Street depôt (meter, motor, and general testing section) or, alternatively, drive round the garden village of Bournville (Cadbury Bros., Ltd.) inspecting the factory sub-station with typical high-voltage consumers' metering equipment. After luncheon at the Grand Hotel, Birmingham, there will be a motor coach excursion to Stratford-on-Avon, Warwick and Leamington.

## I.E.E. Conversazione to Overseas Members

A conversazione and reunion of members of the Institution of Electrical Engineers from overseas is being arranged to take place at the Institution, Savoy Place, Victoria Embankment, London, W.C., on July 11th. The arrangements will, generally, be on the lines of the functions held in 1932 and 1933. Members from overseas who will be in this country at the time of the conversazione and would like to be present should communicate with Mr. P. F. Powell, secretary of the Institution, immediately upon their arrival.

## Appointments Vacant

Consumers' engineer for Middleton Corporation Electricity Department. (See our classified advertisements.)

Technical officer for the Royal Aircraft Establishment, South Farnborough.

(See our classified advertisements.)

## Electric Heating of Concrete

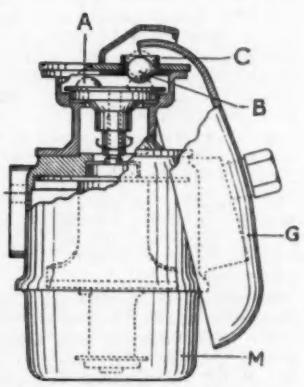
An interesting series of investigations has been made recently in Sweden by H. Bohling and A. Brund concerning the heating of fresh concrete by the passage of electric current, thus enabling building operations to be continued during severe weather without risk of the material freezing. Alternating current is used to avoid electrolysis of the water, and the sheet-iron electrodes are so arranged that as nearly as possible uniform flow of current is obtained throughout the mass of concrete. As the thickness of raw concrete is necessarily limited, satisfactory penetration can be obtained from a series of electrodes of alternately opposite polarity applied to the surface alone, when access cannot be had to the other side. The applied voltage must be increased gradually, say, from 20 to 50 V, to allow for the increase in resistance as the concrete sets.

According to data reproduced in the *Zeitschrift des Vereines deutscher Ingenieure*, the lowest observed energy consumption was 570 kg. cal. or 0.66 kWh per cu. metre to raise the temperature of freshly poured concrete by 1 deg. C.; this corresponds to 35.5 B.Th.u. or 0.0104 kWh per cu. ft. per 1 deg. F. The ambient temperature, area of surface and nature of heat insulation naturally affect the losses and the highest energy consumption observed was 1.4 kWh per cu. m. per 1 deg. C. (0.022 kWh per cu. ft. per 1 deg. F.) in the case of a foundation block.

The electrical heating of concrete has also been investigated in Russia, using three-phase current at 110-220 V with plate electrodes in the case of thin concrete slabs. For massive concrete ½-in. round bar electrodes were employed, these being subsequently cut off and left in place. The atmospheric temperature ranging from −10 to −25 deg. C. (14 to −13 deg. F.) the concrete was warmed at the rate of 5 or 6 deg. C. (9−11 deg. F.) per hr. up to 50 deg. C. (122 deg. F.), maintained at this temperature until it was 24 hours old, then heated to 70−75 deg. C. (158−167 deg. F.) until 36 hours from pouring, and thereafter allowed to cool.

## A New Type of Electric Bell

The accompanying illustration, from *Elektrotechnische Zeitschrift*, shows a new motor-operated electric bell developed by the Siemens & Halske A.G. in co-operation with the Berlin Fire Brigade, and now recommended for industrial establishments, mines, railways and tramways, police and other services where loud ringing is required. No pivoted or spring-supported hammer is employed. Instead, a steel ball *A* fixed in a plate rotated by a vertical motor is used to strike a loose steel ball *B* and throw it sharply against the inner edge of the steel gong *G*. The ball *B* can rise and fall freely in a tubular guide *C*, but cannot escape. The motor *M* may be battery-operated, or it may be a "universal" machine for d.c. and a.c. mains operation. It is enclosed by a weatherproof casing about 9½ in. by 5 in. dia., and runs at 4,000 r.p.m. The gong is 9 in. in diameter and is mounted eccentrically so that by turning it the distance from the striker ball, and therefore the loudness of ringing, can be varied.



A ball-operated bell

## The Generation of Electricity

The official returns rendered to the Electricity Commissioners show that 1,390 million kWh of electricity was generated by authorised undertakers in Great Britain during March, as compared with the revised figure of 1,162 million kWh in the corresponding month of 1933, representing an increase of 228 million kWh, or 19.6 per cent. The number of working days in the month (*i.e.*, excluding Sundays and Good Friday) was twenty-six, as against twenty-seven last year.

During the first three months of 1934, up to the end of March, the total amount of electricity generated by authorised undertakers was 4,269 million kWh as compared with the revised figure of 3,652 million kWh for the corresponding period of 1933, representing an increase of 617 million kWh, or 16.9 per cent.

# The Electricity (Supply) Bill

STANDING Committee "C" of the House of Commons gave further consideration this week to this Bill, which, *inter alia*, contains provisions relating to the entering of premises for the purpose of cutting off the supply.

The Committee accepted an amendment, moved by Sir George Hume, to the effect that the electricity undertakers of a district should have power to inspect all electrical fittings and apparatus in premises connected to their supply, whether such apparatus was their property or not.

Mr. G. K. Peto moved two further amendments, which were also agreed to. The first provided that no undertakers should have the power of entry except through an officer of the undertaking bearing written authority. The other made provision for compensation for any expenses or loss incurred by a consumer whose supply had been disconnected if it were found that there had been no contravention of the regulations.

Mr. J. Batey sought the insertion of a provision that an officer of an undertaking calling on a consumer for the purpose of inspecting his installation should wear uniform, but, on the proposal of Sir John Haslam, he expressed himself as satisfied if the officer was required merely to wear a distinguishing badge.

Upon the motion of Mr. J. A. Parkinson, it was decided to delete a clause providing that the powers of entry should not extend to premises belonging to a railway company, harbour, navigation or conservancy authority, public service undertakers, or local authorities, including county councils.

The following further amendments by Sir G. Hume were accepted: Providing for an appeal to a court of summary jurisdiction where consent to the affixing of brackets to buildings and bridges was unreasonably withheld; deleting a clause which provided that undertakers need not give a supply for extraordinary occasions unless a minimum return were guaranteed; and giving power to an undertaking to cut off the supply of a consumer using it so as to interfere with the general supply until the cause of complaint was removed.

# Our Personal Column

**Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements**

**Mr. E. R. L. Fitzpayne,** chief technical assistant to the Edinburgh Corporation Transport Department, has been appointed transport manager to the South Shields Corporation. Mr. Fitzpayne received his education at George Watson's College and Edinburgh University, where he obtained the degree of B.Sc. (Engineering). He served his apprenticeship in the workshops of the Edinburgh Corporation Transport Department and with the Metropolitan-Vickers Electrical Co., Ltd. He has previously held the appointments of test-room assistant with the Scottish Central Electrical Power Co. and assistant traction engineer with the Metropolitan-Vickers Electrical Co., Ltd. He has been chief technical assistant at Edinburgh for over four years, and during that period has been a representative of the general manager upon the Motor Omnibus Development Committee of the Municipal Tramways and Transport Association. He is an associate member of the Institution of Electrical Engineers, and in 1930 was awarded a £10 premium by the Institution for a paper entitled "Modern Tramway Rolling Stock." He is the author of a number of articles on transport development.

**Mr. E. R. L. Fitzpayne, A.M.I.E.E.**

**Mr. G. A. Vowles,** engineering assistant to the city electrical engineer of Hull, is recommended for the position of borough electrical engineer of Halifax.

**Mr. A. Avison,** A.M.I.Mech.E., has been appointed sales manager to Messrs. David Brown & Sons (Huddersfield), Ltd. He has lately held the position of London manager to the company, and previous to that was chief estimator at its head office.

**Sir Arnold B. Gridley** has been elected to the board of the British-Borneo Petroleum Syndicate.

**Mr. H. G. Osborn,** who recently resigned his position as London manager of the Kersons Manufacturing Co., Ltd., has now joined the Marshall Electrical Co., Ltd.

**Mr. W. E. Highfield** has been elected president of the Batti-Wallah's Society for the ensuing year, and **Mr. M. Whitgift** has been re-elected hon. secretary and treasurer, an office which he has held continuously since 1922. The Committee is as follows: Messrs. A. E. Apps, G. M. B. Hilton, H. S. Jacob, H. S. May, A. E. Mohring and J. W Porter. At the next luncheon of the Society, which will be held at the Hotel Metropole on April 26th, Lord Iliffe, C.B.E., will deliver an address.

*[Elliott & Fry*

**Mr. W. E. Highfield** **Mr. M. Whitgift**

**Mr. J. W. Murray** has resigned from the board of the Telsen Electric Co., Ltd., and Mr. S. Jackson, of Messrs. Whitehill, Marsh, Jackson & Co., and Mr. T. W. Horton, chairman of Messrs. Elkington & Co., Ltd., and Norton Motors, Ltd., have joined the board.

**Mr. P. Nutter,** A.M.I.E.E., has been appointed to the staff of Messrs. John Kirby, to organise and take charge of the new sales department for organ-blowing equipments. Mr. Nutter commenced his electrical career with the Newcastle-upon-Tyne Electric Supply Co., Ltd., in 1904, and he was subsequently with the Kent Electric Power Co., Ltd., the West Ham Corporation Electricity Department, and the National Boiler & General Insurance Co., Ltd. After war service he returned to the company, and in 1920 set up in business as P. Nutter & Son, and later as director of Messrs. Nutter, Son & Edge, Ltd., a position which he relinquished owing to ill-health in 1930. Following brief periods with the North-Eastern Electric Supply Co., and the English Electric Co., Ltd., his health again broke down, and he has only recently been able to resume business.

**Mr. H. M. Barker,** who has been in the service of the Vacuum Oil Co. for twenty-two years, has been elected to the board. He joined the company as salesman in 1912.

**Mr. T. Sutcliffe,** who retired three years ago from the position of chief electrician to the municipality of Benoni, Transvaal, has arrived in this country. His main object is to visit his native city of Liverpool. He has lived in Benoni for some thirty years, and before his departure for England he was entertained at a social gathering by the Mayor, who spoke in high terms of his services.

**Mr. E. E. Sharp,** a director of Venner Time Switches, Ltd., has returned to London from a five-months' tour in the East, including India, Burma, and Siam.

By forty-five votes to nine, Blackburn Town Council, on April 5th, disapproved a recommendation of the Electricity Committee to increase the salary of **Mr. W. A. Royle,** the borough electrical engineer, from £1,000 to £1,200 per annum. Appreciation was expressed of Mr. Royle's work in converting a non-paying undertaking into a remunerative one, and also in increasing the number of consumers and decreasing the cost of generation. But it was contended that to grant the increase at this stage would upset the general standard agreed to between the different departments of the Corporation, and also that the state of local trade did not warrant this course. The Mayor (Alderman C. A. Critchley, J.P.), chairman of the electricity Committee, defended the increase. He said that Mr. Royle had done excellent work which should be recognised. When he came he was given to understand that if he turned the undertaking into a profitable concern the Corporation would doubtless be prepared to consider an increase of salary, especially as the borough engineer was then receiving £1,250, as also was the borough treasurer. A saving of one-hundredth of a penny per kWh meant £1,250 to the town, and Mr. Royle had saved them many hundredths.

**Dr. W. G. Thompson, the author of the paper on the Marx rectifier read at the I.E.E. last evening.** **(See page 523)**

**Mr. R. H. Cobbold,** the author of the article on "D.C. to A.C. Change-overs" on page 521 of this issue, took the Mechanical Science Tripos at Cambridge, and thereafter spent one and a half years with the British Aluminium Company's Kinlochleven factory. After a brief period with the Gramophone Co. he joined Messrs. Kennedy & Donkin. He remained with them for over four years, during which period he acted as resident engineer for the d.c. to a.c. change-over at Bridlington. Last year he became change-over engineer to the City of Winchester Electricity Department, and so it will be seen that he has ample practical experience of the subject with which he deals in his article.

**Mr. W. Guthrie,** Glasgow, has been appointed by the Falkirk Town Council as assistant electrical engineer in the Corporation electricity undertaking. Mr. Guthrie is at present the Scottish representative of Messrs. Kennedy & Donkin.

**Mr. R. G. Devey** has been nominated for the chairmanship of the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers for the session 1934-35.

**Mr. G. R. J. Parkinson,** M.I.E.E., was elected chairman of the West Midlands Joint Electricity Authority at a meeting of the Authority held on April 6th. Mr. Parkinson was recently elected a director of the Midland Electric Power Corporation for Power Distribution, Ltd., on his retirement from the position of manager and engineer of the company.

At the same meeting the Authority decided to present Alderman Bell with a sealed resolution of appreciation of his services at a suitable function to be arranged. Councillor Southan, the chairman of the Wolverhampton Corporation

Electricity Committee, was appointed vice-chairman of the Technical Operating Committee. Mr. A. H. Davies was re-elected chairman of the General and Finance Committee, and Mr. Heathcock chairman of the Salaries and Wages Committee.

**Mr. A. F. Harris,** chairman and managing director of Messrs. Nalder Bros. & Thompson, Ltd., was married on April 5th

**Mr. and Mrs. A. F. Harris after their marriage at St. John's Church, S.W.**

to Miss Lilian McCalman, at St. John's Church, Smith Square, S.W. We extend our congratulations.

**Dr. Irving Langmuir,** associate director of the research laboratory of the General Electric Co. of New York, has been appointed honorary chancellor of Union College, Schenectady, New York, for the current year. He will deliver the principal address at the 138th annual commencement exercises of the college on June 11th.

**Mr. D. Middleton,** secretary of the Teeside Branch of the Electrical Industries Benevolent Association, was presented with a gift by the Branch Committee at a dinner and social evening, held in Middlesbrough on April 8th, as a mark of their appreciation of his services and the occasion of his recent marriage. Mr. A. T. Griffith, the treasurer, announced that the fourth annual ball, held recently, had realised £90, and tribute was paid to **Mr. R. H. Scotson,** who has been chairman of the committees organising the function since its inception.

**Dr. S. L. Pearce,** engineer-in-chief to the London Power Co., Ltd., at the invitation of the Committee of the Privy Council for Scientific and Industrial Research, has agreed to serve as a member of the Fuel Research Board. The appointment is for a period of four years as from April 1st.

**Sir Felix Pole** is to investigate the position of Transport in Northern Ireland for the Government. A circular has been issued by the Minister of Home Affairs to the various transport authorities, the Chambers of Commerce, and the associations representing local authorities, stating that Sir Felix will be prepared to discuss transport problems with the representatives of the interests concerned.

**Mr. H. W. Blower,** who holds an appointment under the Central Electricity Board, and Miss S. I. Bristow, who was a member of the staff of the English Electric Co., Ltd., were married recently at Stafford.

**Mr. L. L. Robinson,** who retired from the position of borough electrical engineer at Hackney in January last, but continued to act as temporary borough electrical engineer, relinquished the latter position as from March 31st last, and has now retired on superannuation. The Borough Council has placed on record its appreciation of his thirty-three years' service as borough electrical engineer, and of the efficient and able manner in which he has carried out his duties. It is proposed to engross a copy of this resolution on vellum and present it to Mr. Robinson.

**Mr. W. A. Hutchings** has been nominated as branch president of the South Wales Branch of the Association of Mining Electrical Engineers for the session 1934-35.

## Obituary

**Mr. J. Simpson,** for many years on the staff of the British Thomson-Houston Co., Ltd., Rugby, died suddenly on March 28th at the age of sixty years. He joined the company in London, and went to Rugby when the works there were erected in 1902.

**Dr. S. Melville.**—The death has occurred in London, at the age of sixty-six, of Dr. Stanley Melville, president of the British Institute of Radiology. He was one of the pioneers of the medical applications of the new science, and was secretary of the X-ray and Radium Protection Committee which formulated the protective measures required to be taken against the dangers of X-ray work. He was honorary radiologist at St. George's Hospital and at the Brompton Hospital for Diseases of the Chest, and was also examiner in radiology at Cambridge and Liverpool Universities. He was a Fellow of the Royal Society.

**Mr. E. T. Tobin.**—The death occurred on April 6th, as the result of a motoring accident near Kettering, of Mr. Edward Thomas Tobin, sales engineer on the London staff of the General Electric Co., Ltd. Mr. Tobin, who was thirty-eight, graduated at Dublin University, and was formerly with the English Electric Co. He entered the service of the G.E.C. in 1930.

**Mr. A. Baker.**—The death took place on April 3rd at Jarrow-on-Tyne of Mr. Alfred Baker, who for thirty years was head electrician to Palmer's Shipbuilding and Iron Co., Ltd., Jarrow and Hebburn. Mr. Baker, who was seventy-eight, had supervised the electrical work on many of the ships built by Palmer's. In 1889 he visited Spain and carried out the electrical work on three war vessels being built at Bilbao for the Spanish Government which were designed by Palmer's.

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**Will.—Mr. H. S. Deacon,** one of the founders of Cryselco, Ltd., left £22,836 (net personalty £20,805).

# Financial Section

### New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

## New Companies Registered

**B. H. Radio Service & Television, Ltd.**—Private company. Registered April 5th. Capital, £600 in £1 shares. Objects: To acquire the business of a wireless and television dealer, &c., formerly carried on by B. T. Hogben, under the style of Bernard Hogben, at 272, High Road, Tottenham, N. The permanent directors are: B. T. Hogben (chairman) and Eva C. Hogben, both of 272, High Road, Tottenham, N.15; and C. P. Pugsley, 47, College Gardens, Edmonton, N.18.

**Newmans (Electrical Services), Ltd.**—Private company. Registered April 5th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical, mechanical and radio engineers and manufacturers of and dealers in wireless apparatus, gramophones, &c. The first directors are: J. W. Newman, 73B, St. James Street, Brighton, and three others. Secretary: J. W. Newman. Registered office: 58, West Street, Brighton.

**North Cheshire Electric Co., Ltd.**—Private company. Registered April 5th. Capital, £500 in £1 shares. Objects: To acquire the business of radio and electrical engineers and dealers heretofore carried on by W. G. Hughes and R. W. Hodson at 48, Station Road, Cheadle Hulme, Cheshire. The first directors are: W. G. Hughes, 7, Burnham Avenue, Levenshulme, Manchester; and R. W. Hodson, 34, Brook Road, Heaton Chapel, near Stockport. Solicitors: Gerald F. Littler, 49, King Street, Manchester.

**T. and M. Electrical Company, Ltd.**—Private company. Registered March 31st. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and importers of, agents for and dealers in electrical and wireless plant, machinery, apparatus and accessories, &c. The first directors are: I. Oslof, T. Oslof and M. Oslof, all of 5, Berkeley House, Belsize Road, N.W.6. Registered office: 157, Wardour Street, W.1.

**Newtons of Taunton, Ltd.**—Private company. Registered April 5th. Nominal capital, £100 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers of and dealers in electrical machinery, and electrical and other equipment and accessories for motor vehicles of all kinds, stationary engines, omnibuses, road and railway motor coaches, &c. The subscribers are: G. H. Cockin, "Highgate," Haden Hill, Old Hill, Staffs; and W. Brookes, Bagnall, 129, Jeffcock Road, Wolverhampton. Registered office: Well Street, Birmingham, 19.

**Denmans Electricity, Ltd.**—Private company. Registered March 31st. Capital, £1,000 in 1s. shares. Objects: To adopt an agreement with Arthur Denman, and to carry on the business of electricians, mechanical engineers, suppliers of electricity for light, heat, motive power or otherwise, &c. The subscribers are: F. G. Huggett, "Burghfield," Blackamoor Lane, Maidenhead; and A. Denman, 21, Wedmore Road, Greenford, Middlesex. A. Denman signs documents as director. Registered office: 13, Finsbury Square, E.C.2.

**Streeters Radio, Ltd.**—Private company. Registered March 29th. Capital, £200 in 2s. shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in radio and electrical apparatus, &c. The directors are: E. G. Streeter, senr., and E. G. Streeter, junr., both of 5, Coombe Road, Croydon. Registered office: 10, Katherine Street, Croydon.

**G. W. Davies & Co., Ltd.**—Private company. Registered March 29th. Capital, £1,000 in £1 shares. Objects: To acquire the business carried on at Newcastle-upon-Tyne as G. W. Davies & Co., to adopt an agreement with S. S. Keel and C. W. Keel,

and to carry on the business of electrical factors, electricians and electrical engineers, manufacturers of and dealers in (by hire purchase, deferred payment or otherwise) telephones, wireless apparatus, &c. The subscribers are: S. S. Keel, 3, Thorntree Drive, Denton Bank, Newcastle-upon-Tyne; and C. W. Keel, "Westleigh," Thorntree Drive, Denton Bank, Newcastle-upon-Tyne. Secretary: C. W. Keel.

**Birmingham Home & Office Telephone Co., Ltd.**—Private company. Registered April 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in instruments or plant used in connection with telephones and telegraphs, &c. The first directors are: T. D. Stoneham and B. J. Engel. Solicitors: Stoneham & Sons, 108a, Cannon Street, E.C.4.

**New Industrial Products, Ltd.**—Private company. Registered April 7th. Capital, £500 in £1 shares. Objects: To act as agents, representatives and distributors of electrical signs and devices, glass and metal ware, bakelite and plastic moulded articles, &c. The first directors are: G. H. Bielski, 47, Elmcroft Crescent, Golders Green, N.W., and W. J. Stamp, 302b, Park Road, Hornsey, N.8. Registered office: Broadway Chambers, 7, Broadway, Ludgate Hill, E.C.

**V. & G. Joyce, Ltd.**—Private company. Registered April 7th. Capital, £2,000 in £1 shares. Objects: To carry on the business of electricians, electrical, radio and mechanical engineers, &c. The directors are: A. G. Joyce, 1, Upper Dane Road, Margate, and two others. Solicitors: Malcolm D. Borg, 9, Cecil Square, Margate.

**Vidor, Ltd.**—Private company. Registered April 7th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, mechanical, electrical and general engineers, manufacturers of and dealers in engineering, electrical, steam and scientific appliances and apparatus, wireless apparatus, &c. The Subscribers are: R. P. Richardson, 100, Sandy Lane, Teddington, Middlesex, and two others. Richard P. Richardson is one of the first directors.

**Compagnie Sturtevant, Ltd.** (originally registered as an unlimited company on December 16th, 1920), re-registered as a private limited company on March 28th, 1934, by P. J. Tidmarsh. Nominal capital, £100 in £1 shares. The unlimited company had no nominal capital divided into shares, but 94 per cent. of the undertaking was owned by the Sturtevant Engineering Co., Ltd., and one per cent. each by the Christy Safety Razor Co., Ltd., the Croydon Engineering Co., Ltd., Investment Securities, Ltd., Iris Cars, Ltd., A. & R. Mason, Ltd., and E. Reader & Sons, Ltd. (Nottingham). For balance sheet purposes the capital at December 31st, 1932, was stated as 63,354 fr. The unlimited company was formed to take over the business formerly carried on in France and elsewhere as "Compagnie Sturtevant," and to carry on the business of engineers, installers of fans, blowers, exhausters, and fertiliser machinery, crushing and grinding machinery, &c. The directors are: G. A. Mower, 14, Collingham Gardens, S.W., G. R. Thursfield, 30, Cheyne Walk, Chelsea, M. A. Doggett, 40, Woodbastwick Road, S.E., L. M. Paterson, Fox Hill, Aylesbury, and F. W. R. Williams, Dunvegan, Manor Way, Purley, Surrey. Secretary: P. K. Noad. Registered office: 147, Queen Victoria Street, E.C.4.

**R.A.P., Ltd.**—Private company. Registered March 26th. Capital, £3,000 in 2,500 preference shares of £1 each and 10,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in or distributors of radio instruments, gramophones, &c. The subscribers are: W. H. Berriedale-Johnson and Mrs. Belle Berriedale-Johnson, both of The Stump, Riversdale Road, Thames Ditton. W. H. Berriedale-Johnson signs documents as managing director. Registered office: 13, Creek Road, East Molesey.

**Whitaker Electric Co., Ltd.**—Private company. Registered March 29th. Capital, £500 in 10s. shares. Objects: To carry on the business of manufacturers and repairers and hirers of and dealers in electrical and mechanical apparatus and accessories, in particular wireless sets, &c. The directors are: C. Whitaker, 22, Mayfield Avenue, Kenton, Middlesex, and H. Whitaker, 17, Minstead Way, Malden, Surrey. Registered office: 24, Percy Street, Tottenham Court Road, W.C.2.

**R. O. Bridger & Co., Ltd.**—Private company. Registered March 29th. Capital, £2,500 in 2,000 7 per cent. cumulative preference shares of £1 and 10,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in wireless apparatus, &c. The subscribers are: R. O. Bridger, 4, Shelford Place, Church Street, N.16, and J. R. Woodley, 34, Gresham Street, E.C. Secretary: John R. Woodley.

# Returns of Electrical Companies

**Super Radio (Liverpool), Ltd.**—C. B. Burrows, North House, North John Street, Liverpool, was appointed receiver on March 26th, 1934, under powers contained in debenture dated December 23rd, 1932.

**British Electrical Maintenance and Insurance Co., Ltd.**—H. E. Gadd, The Firs, New Road, Bournemouth, was appointed receiver and manager on April 3rd, 1934, under powers contained in debenture dated September 13th, 1933.

**Anglo-Portuguese Telephone Co., Ltd.**—The nominal capital has been increased by the addition of £250,000 in £1 ordinary shares beyond the registered capital of £1,100,000.

**West Kent Electric Co., Ltd.**—The nominal capital has been increased by the addition of £200,000 in £1 ordinary shares beyond the registered capital of £300,000.

**Domestic Electrification, Ltd.**—Capital, £50,000 in £1 shares Return dated October 6th, 1933. 40,000 shares taken up. £40,000 paid. Mortgages and charges, nil.

**Stearn Electric Co., Ltd.**—Capital, £4,000 in £1 shares. Return dated October 25th, 1933. All shares taken up. £2 paid, £3,998 considered as paid. Mortgages and charges: £20,000.

**G. S. Hawker, Ltd.**—Capital, £1,000 in £1 shares. Return dated October 28th, 1933. 900 shares taken up. £400 paid, £500 considered as paid. Mortgages and charges: £824.

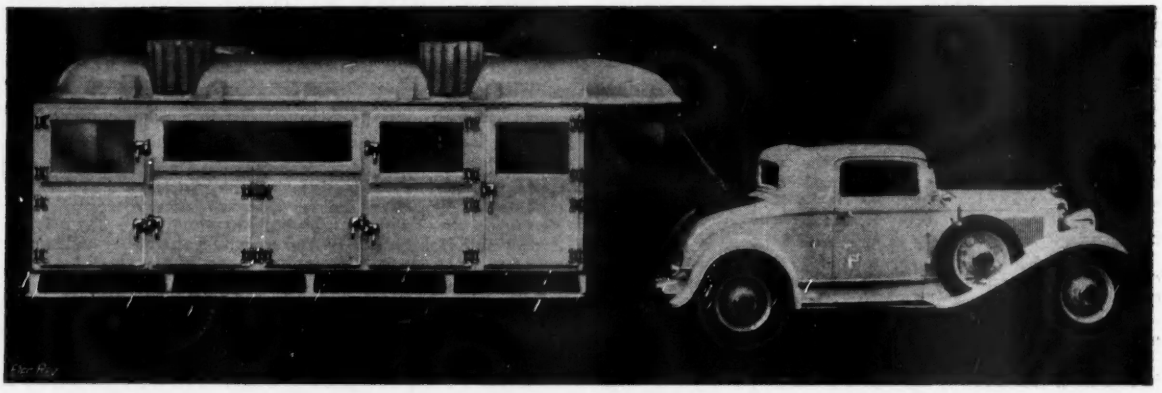
**T. C. Gilbert & Co., Ltd.**—Capital, £5,000 in £1 shares. Return dated October 24th, 1933. 3,200 shares taken up. £2,300 paid, £900 considered as paid. Mortgages and charges, nil.

**Sun Electrical Co., Ltd.**—Capital, £250,000 in 125,000 preference and 125,000 ordinary shares of £1. Return dated October 13th, 1933. 125,000 preference and 93,311 ordinary shares taken up. £218,311 paid. Mortgages and charges, nil.

**Watson & Henderson, Ltd.**—The nominal capital has been increased by the addition of £8,000 in £1 shares beyond the registered capital of £10,000.

**Violite (1933), Ltd.**—J. Diamond, 2, Henrietta Street, W.C.2, was appointed receiver and manager on March 23rd, 1934, under powers contained in debenture dated September 22nd, 1933.

**Midland Rediffusion Service, Ltd.**—Particulars filed of debentures not exceeding £4,000 authorised March 5th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,000.



**The B.T.H. mobile refrigerator exhibition mentioned on page 531**

**West Gloucestershire Power Co., Ltd.**—Particulars have been filed of debenture stock to secure £550,000 and any further stock (total amount not to exceed the nominal amount of the issued and fully paid up share capital), authorised March 9th, and covered by trust deed of same date. The amount of the present issue is £550,000. Property charged: Land and buildings near Upper Forge Mill, Lydney, Glos, and the company's undertaking and other property, present and future, including uncalled capital. Trustees: British Empire Trust Co., Ltd., Stafford House, 14/20, King William Street, E.C.

**W. Burns & Co., Ltd.**—Debenture, dated March 23rd, 1934, to secure sums not exceeding £500 which the chargee may be called upon to pay to Lloyds Bank, Ltd., under a guarantee. Property charged: The company's undertaking and property, present and future, including uncalled capital. Holders: W. J. McLeod, 81, Holland Park, W.11.

**Franco-British Electrical Co., Ltd.**—Debenture charged on deeds and documents relating to freehold land, factory, buildings and premises formerly part of London Aerodrome, Hendon, and the company's undertaking and other property, present and future, including uncalled capital, dated March 22nd, 1934, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

**Ensign Lamps, Ltd.**—First mortgage debenture, dated March 23rd, 1934, to secure £10,000, charged on land and buildings in Kent Street, Preston, and company's other property, present and future, including uncalled and unpaid capital. Holders: Atherton Bros., Ltd., Hanover Street Foundry, Preston.

**York Relay Services, Ltd.** (Old company).—Satisfaction in full on February 23rd, 1934, of debenture dated November 1st, 1933, and registered November 14th, 1933. (According to the register of mortgages, the debenture registered November 14th, 1933, originally secured all moneys due to bank.)

**Vince's Dry Batteries, Ltd.**—Debenture dated March 27th, 1934, to secure £6,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Westminster Bank, Ltd.

**Electric and General Investment Co., Ltd.**—Particulars filed of debenture stock to secure £99,500 and premium of 5 per cent. authorised by resolutions of January 24th, 1934, and March 27th, 1934, and covered by trust deed dated March 27th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued. (Trustees: W. Parker and S. E. Garcke.)

**R. F. Winder, Ltd.**—Mortgage on properties, &c., at Holbeck, Leeds, dated March 22nd, 1934, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

**Park Radio & Engineering Co., Ltd.**—J. W. Sears, 4, Parkshot, Richmond, Surrey, ceased to act as receiver and/or manager on February 12th, 1934. (Notice filed April 4th, 1934.)

**Latham Productions, Ltd.** (formerly Whitworth Electrical Repairs, Ltd.).—D. R. Macdonald, Abbey House, Baker Street, N.W., was appointed receiver on March 29th, 1934, under powers contained in debenture dated December 6th, 1933.

# City Notes

**The British Thomson-Houston Co., Ltd.**, held its annual meeting on April 11th, when Mr. W. C. Lusk (chairman), who presided, said that the capital expenditure during the year included about £30,000 in connection with the provision of additional facilities for the production of bulbs at their Chesterfield glassworks for "Mazda" lamps, and the necessary expenditure at the Rugby works to accommodate the work taken over from the Ladywood Ironworks, Ltd. They also extended their facilities for the manufacture of certain new lines of domestic appliances such as B.T.H. refrigerators and "Hotpoint" cookers, washing machines and water heaters, all of which, except the refrigerators, were marketed through their subsidiary, the Hotpoint Electric Appliance Co., Ltd. The shipments from their factories during 1933 were less than for the previous year and considerably below normal. The effects of the world-wide depression of 1931 and 1932 extended well into 1933, but during the latter part of the year there was an improvement, and the amount of business received during the year was greater than for the previous year. Prospects for 1934 were better, and orders received during the first three months of the current year exceeded those for the corresponding period of 1933. There was an increase of 10 per cent. in the number of employés as compared with a year ago. In the home market the lack of orders for central station generating plant, consequent upon the completion of the grid, had been felt severely, but orders from industrial undertakings such as paper mills, chemical and steel works, &c., showed a gratifying increase. Among those orders were a.c. electric drives for two of the largest newsprint machines in the world, one for Bowater's Mersey Paper Mills and the other for Edward Lloyd's extension at Kemsley, rolling mill equipment for Thomas Firth and John Brown, Ltd., and motor convertors for Imperial Chemical Industries, Ltd. Two steel-tank mercury arc rectifiers had been supplied to the B.B.C. for supplying 20,000 V d.c. power to the transmitters of the new Midland Regional station at Droitwich. They supplied two 75,000-kW turbo-generators for the Barking power station, two 20,000-kW generators for the Tummel hydro-electric power station of the Grampian Co., and a 50,000-kW turbo-generator for the Ironbridge station of the West Midlands J.E.A. They had received an order from the Shropshire, Worcestershire & Staffordshire Power Co. to reconstruct a 22,000-kW turbo-alternator for 33,000-V operation. They supplied the electrical equipment for the Diesel-electric tug *Lectro*, which was operating on the Thames, and the Diesel-electric ferry boat *Electric Star*, which was in service at Hong Kong. Export orders received included a 22,500-kW turbine for the Shanghai Power Co., a similar machine for Schaerbeek, Belgium, complete power stations for the Ahmedabad Electricity Supply Co. in India, and for the Tantah Municipality in Egypt, a large number of generators for the Iraq Petroleum Co.'s new pipe line to Haifa, several electric winders and steam turbo-alternator sets for South Africa and Rhodesia, and a complete rolling mill equipment for the Broken Hill Proprietary Co. of Australia. They had introduced a gas discharge lamp, the "Mazda Mercra," for highway and industrial lighting. Regarding their sound reproducing and talking picture equipments they could now supply 16-mm. portable equipment.

**The Brompton & Kensington Electricity Supply Co., Ltd.**, held its annual meeting on April 5th, when Mr. H. R. Beeton (chairman) said that during the past year the Electricity Commissioners had fixed the new standard price at 2.657d. per kWh, as against 4.604d. previously. This rate operated retrospectively as from January 1st, 1932, and the difference since then between it and the lower price they had been able to charge represented their customers' benefit, one-third of which the directors might reserve or distribute by way of additional dividend and co-partnership benefit. On this basis the benefit conferred on their consumers during the past two years had amounted to upwards of £43,000, but their profits, after providing for costs, standard dividend, and the sinking funds requisite to liquidate their assets on the surrender of their undertaking in 1971, had amounted to only £13,500. Of this amount they had allocated £3,000 by way of co-partnership benefit to employés, and they had carried forward £10,500 to meet contingencies. Their output last year, in spite of the prevailing depression, showed an increase of 9 per cent., but owing to the reduction in the average price, the revenue yielded an increase of only 4½ per cent. The growth of the output for all uses was satisfactory, and it was larger for cooking and heating than for lighting.

**The Chelsea Electricity Supply Co., Ltd.**—Presiding at the annual meeting held on April 5th, Mr. W. R. Davies (chairman) said that considerable progress was made during the year in the gradual changing over from d.c. to a.c. The expenditure incurred in this direction had been at the rate of about £3,000 per annum. At the end of the year the number of consumers supplied under the two-part tariff was 1,545 out of a total of 8,367, *i.e.*, only 18 per cent., but it was interesting to note that the electricity supplied to these consumers was approximately one-half of the total output. The average consumption by such customers last year was 4,685 kWh each, as compared with a consumption of 1,074 kWh by each customer supplied at the ordinary rates. They had decided to build a block of all-electric flats in the vicinity of Cheyne Gardens, in order to demonstrate the many electrical devices available for domestic use, and they believed that these flats would serve the double purpose of educating the public in the advantages to be obtained from the full use of electrical appliances and of increasing their output.

**Associated Electrical Industries, Ltd.**, reports a balance for 1933 of £397,169, as compared with £474,359 in 1932. After deducting debenture interest, depreciation and income-tax, and adding £102,415 brought in, there is a total of £286,813 available. As reported in our issue of March 30th, the ordinary dividend is 3 per cent. (against 4 per cent.), and £102,615 is carried forward. The report states that the trading results reflect the industrial depression which has been the outstanding feature of the last two years. Orders executed during the year were considerably below normal. Orders received, however, as well as those in hand at the end of the year, showed an increase over those for 1932. At the annual meeting which was to be held yesterday (Thursday) it was proposed to recommend the conversion of the cumulative preference shares and ordinary shares into cumulative preference and ordinary stock.

**The Ever Ready Trust Co., Ltd.**, reports a balance of £28,766 for the fifteen months to March 31st last, and to this is added £3,835 brought in, making £32,602. It is proposed to pay a final dividend of 4½ per cent. on the ordinary and deferred shares, making 8½ per cent., for the period, equivalent to 6.8 per cent. per annum (against 5½ per cent. for the year ended December 31st, 1932), and to carry forward £1,320. In February, 1933, 400,000 8 per cent. cumulative preference shares in Lissen, Ltd., were offered for sale, and the offer was heavily oversubscribed for. During the year £300,000 of the capital was returned to the shareholders. Meeting: April 16th.

**Edmundson's Electricity Corporation, Ltd.**, reports that during March the electrical energy generated and purchased by its undertakings totalled 47,086,000 kWh, as compared with 39,254,000 kWh in the corresponding month of 1933, an increase of 20 per cent. The total for the first three months of the current year was 145,449,000 kWh, an increase of 19 per cent., as compared with the corresponding period of last year.

**The Tamworth District Electric Supply Co., Ltd.**, reports a profit for 1933 of £14,190, and after placing £4,750 to depreciation reserve and £250 to taxation reserve, there is a balance of £9,190, which with £1,411 brought in makes £10,601 available. The final ordinary dividend is 4 per cent., making 6 per cent. for the year, and £1,601 is carried forward. The sales of electricity totalled 3,807,000 kWh, as compared with 3,248,000 kWh in 1932.

**The Telsen Electric Co., Ltd.**, announces that in view of the fact that the new board took over the management of the company on March 21st last it has been decided to close the books on March 31st, 1934, and to publish accounts for the period July 1st, 1933, to March 31st last. The annual meeting will probably be held about the middle of May.

**The Cambridge Electric Supply Co., Ltd.**, reports a balance on the net revenue account for 1933, including the amount brought in, of £44,765. It is proposed to pay a final ordinary dividend of 4 per cent., making 8 per cent. for the year, and to carry forward £3,265.

**The Charing Cross Electricity Supply Co., Ltd.**, has decided to redeem part of the 4½ per cent. debenture stock. Portions to be redeemed will be decided by lot and will be paid off on July 15th at 102 per cent., with interest to that date.

**The West London & Provincial Electric & General Trust, Ltd.**, has announced a final ordinary dividend of 3 per cent., making 4½ per cent. for the year (against 3 per cent.).

# Stocks and Shares

TUESDAY EVENING.

THERE started, this week, Stock Exchange dealings in the newly issued three per cent. Funding Loan, for which the Government asked 98. The total amount was £150,000,000. Eager as the investor is to acquire safety-first stock, the price proved to be a little high, even for present-day appetite, with the result that the price went back to 10s. discount. The effect upon the rest of the gilt-edged market was to make prices a little easier. A general reaction occurred amongst British Government issues, this in turn being reflected upon the first-rank stocks in most of the other markets. When the Funding stags were "out," however, the price rallied to par, *i.e.*, 98, and the rest of the market correspondingly recovered. Central Electricity 5 per cent. of 1950-1970 has risen a point to 114. The latest 3½ per cent. stock at 97 is also 1 up, and gains have been secured by some of the other stocks in this section.

London Passenger Transport stocks are steady, the "C" holding its improvement of a week ago. A small amount of North Wales Power 4½ per cent. debenture, May and November interest, and dated 1930-1953, is on offer at 105. This is one of the Trade Facilities Act stocks, eligible for trustees, and the return is £4 7s. per cent. on the money. The stock can be paid off, however, at any interest date from the 1st of next month by three months' notice being given. Holders accordingly must not ignore the possibility of having their stock redeemed at 100 at short notice. The market estimate of the life of the issue is 12½ years.

### 1924-1934

An interesting table has been prepared by a leading firm in the Stock Exchange market for electricity supply shares, in order to show the present position of a purchaser of 100 ordinary shares in any company out of a baker's dozen mentioned. The list applies to the case of any investor who bought the shares at the mean price ruling during 1924, and who has

taken up whatever new ordinary shares have been issued from time to time. The table shows a profit on the selling price, during the ten years, ranging from 62 per cent. in the case of Scottish Power ordinary up to no less than 250 per cent. in that of Bournemouth & Poole ordinary. Profits of more than 100 per cent. are available to the then purchaser of Midland Electric Corporation (154), County of London (143), Electric Supply Corporation (132), and Metropolitan Electric (113). In regard to income, the Stock Exchange firm points out that a purchaser of an equal number of all the shares given in the table would have received a gradually increasing income, which for 1933 represents a return of 7¼ per cent. on the money invested. The average profit, taken over the whole of the group, would be 104 per cent.

### Home Electricity Supply

Many of the ordinary shares amongst Home electricity supply companies are now ex the dividends declared for the final half of 1933. Shares in a dozen of the undertakings were marked ex dividend on the Monday in this week. As is usually the case, the deductions were mostly recovered. Reference to our price-lists will show that a number of this week's ex dividend prices are the same as the cum dividend figures of a week earlier. Metropolitan ordinary shares are better at 53s.

West Gloucestershire ordinary is the principal feature with a rise of 8 points, to 88. A fortnight ago the price was 75. The preference is very firm at 119. British Power & Light ordinary are 21s. 6d., Atlas ordinary 8s. 3d.

### Manufacturing and Equipment

Telegraph Construction shares have been flat as a result of the loss for 1933 of £24,600. The figures were given last week on page 507 of the Electrical Review. They came as a distinct disappointment, but the price of the shares, after dropping to 22s., recovered to their previous level of 23s. 9d. on the impression that the current year's working is likely to show better figures than those just published. Associated Electrical Industries, after a drop to 15s. 9d., rose to 17s. 9d., here, again, the disappointment felt with the reduced dividend of 3 per cent. being neutralised by hopes of more cheerful business conditions this year. A rumour has been current to the effect that the Associated Electrical Industries group was the subject of negotiations by the Tobacco Securities Trust, which latter, according to report, desired to obtain controlling interest in the A.E.I. Sir Hugo Cunliffe-Owen, vice-chairman of the Tobacco Securities Trust, contradicted the rumour, and declared that the Tobacco Securities Trust had not been in negotiations in any shape or form for the company's shares. British Aluminium ordinary are a little better at 29s. ex dividend. British Insulated, on the other hand, reacted to 3½ ex dividend. The price of Brush ordinary is nominally lower at 35; stock changed hands a few days ago at 32. Amongst other shares, Electric Constructions have been active, and the price rose to 11s. 3d.

The preference descriptions continue in persistent demand. General Electric 6½ per cents are 9d. higher at 30s. 9d. In certain cases, electrical preference shares are practically unobtainable. Ericsson Telephone preference stand at 28s. 6d.; the ordinary shares have risen to 70s. 9d. Arons are strong at 54s. Reyrolles at 51s. 6d. are now ex dividend. Philips Incandescent Lamps gave way to 46s. but recovered to 46s. 9d. Enfield Rolling Mills keep firm at 32s. 6d. Electrical and Musical ordinary have moved narrowly, and at 25s. 6d. are threepence down on balance.

### Cables and Wireless

Reference has been made here already to the coming into Shorters Court, adjacent to the Stock Exchange, of Imperial & International Communications. This will take place during the present month. Anticipating an increase in business as a result, a few buyers have come along for Cables & Wireless preference and "A" ordinary stocks, both of which have recovered a point. The former stands at 72½ and, if the full dividend of 5½ per cent. were to be paid, the yield would be practically 7¾ per cent. on the money, leaving out of account the arrears which have accumulated on the stock. At present a dividend of 2¾ per cent. is distributed, giving a return on the money of less than 4 per cent. Anglo-American Telegraph stocks are better, the preferred advancing to 113¾. Great Northern Telegraphs have gone back to 37¾. Marconi Marine shares are moving irregularly, part of the recovery secured as a result of the dividend declaration of 7½ per cent. having been lost during the past few days. At 30s. 9d. the shares show 1/8 fall. American Telephone & Telegraph, after a rise to 117½, reverted to 115½, and Internationals at 14¾ have gained the fraction.

### Miscellaneous Matters

At 620, the deferred stock of British Electric Traction is 20 points higher. Demand for the stock—the price of which renders it caviare to the smaller investor—is encouraged by the appreciation that is taking place in the share interests of the company. Amongst dollar stocks, Brazilian Tractions are harder, but the gamble in West African mining shares eclipses the attention ordinarily paid to Latin-Americans. Hopeful anticipations are rife as to the Babcock & Wilcox dividend, declaration of which is imminent. The rubber share market makes a slightly better showing. Industrials of all kinds are in considerable request, and the Stock Exchange markets are attracting a daily expanding volume of business.

## Share List of Electrical Companies

| | Nom. | Dividend. 1932. | Dividend. 1933. | Price. Apl. 10. | Rise or Fall. | Yield. p.c. £ s. d. |
|---|---|---|---|---|---|---|
| **Home Electricity Companies.** | | | | | | |
| Bournemouth and Poole ... ... | 1 | 15 | 15 | 78/9xd. | +⅛ | 3 16 2 |
| Brompton Ordinary ... ... | 1 | 7 | 7 | 84/6xd. | +6d. | 4 1 2 |
| Charing Cross Ordinary ... ... | 1 | 7 | 7 | 35/6 | — | 3 19 0 |
| Chelsea ... ... ... ... | 1 | 7 | 7 | 84/6xd. | — | 4 1 2 |
| City of London ... ... ... | 1 | 7½ | 7½ | 37/-xd. | +6d. | 4 1 1 |
| Clyde Valley ... ... ... | 1 | 7 | 7 | 42/6xd. | +6d. | 3 5 8 |
| County of London... ... ... | 1 | 10½ | 10½ | 59/6xd. | +⅛ | 3 11 0 |
| Edmundson's 7% Pref. ... ... | 1 | 7 | 7 | 34/- | — | 4 2 4 |
| Elec. Dis. Yorkshire ... ... | 1 | 9 | 9 | 49/9 | — | 3 13 9 |
| Elec. Supply Corporation ... | 1 | 11 | 11 | 76/3 | — | 2 17 8 |
| Kensington Ordinary ... ... | 1 | 7 | 7 | 35/- | — | 4 0 0 |
| Lancs Light and Power ... ... | 1 | 7 | 7½ | 38/9xd. | +6d. | 3 17 4 |
| London Electric ... ... ... | 1 | 7 | 7 | 35/6 | — | 3 19 0 |
| Metropolitan ... ... ... | 1 | 10 | 10 | 53/- | +6d. | 3 15 6 |
| Midland Counties ... ... ... | 1 | 7 | 7 | 38/9 | — | 3 12 0 |
| Mid. Elec. Power ... ... ... | 1 | 8 | 8 | 42/6xd. | — | 3 15 3 |
| North Eastern Electric Ordinary | 1 | 6 | 6 | 35/-xd. | — | 3 8 7 |
| Do. 7% Pref. ... ... | 1 | 7 | 7 | 35/-xd. | +6d. | 4 0 0 |
| Northampton ... ... ... | 1 | 10 | 10 | 56/3 | — | 3 11 3 |
| Notting Hill 6% Pref. ... ... | 10 | 6 | 6 | 13¾ | — | 4 8 11 |
| North Met. Elec. Ordinary ... | 1 | 10 | 10 | 68/9 | — | 3 2 10 |
| Do. do. 6% Pref. ... | 1 | 6 | 6 | 31/6 | — | 3 16 2 |
| St. James' and Pall Mall ... ... | 1 | 7 | 7½ | 36/6 | — | 4 3 4 |
| Scottish Power ... ... ... | 1 | 8 | 8 | 2⅛xd. | — | 3 17 6 |
| South London ... ... ... | 1 | 7 | 7 | 35/6xd. | +6d. | 3 19 0 |
| Westminster Ordinary ... ... | 1 | 7 | 7 | 35/- | — | 4 0 0 |
| Whitehall Elec. Invst. 7½% Pref. | 1 | 7½ | 7½ | 22/- | — | 6 16 4 |
| Yorkshire Elec. ... ... ... | 1 | 8 | 8 | 49/6 | — | 3 4 9 |
| **Public Boards.** | | 1931. | 1932. | | | |
| Central Electricity, 1950–70 ... | Stock | 5 | 5 | 114 | +1 | 4 7 9 |
| Do. 1955–75 ... | ,, | 5 | 5 | 115 | — | 4 7 0 |
| Do. 1951–73 ... | ,, | 4½ | 4½ | 110 | +½ | 4 1 10 |
| Do. 1963–93 ... | ,, | — | 5½ | 97 | +1 | 3 12 2 |
| London & Home Counties, 1955–75 | ,, | 4½ | 4½ | 110 | +1 | 4 1 10 |
| London Passenger Transport, A... | ,, | — | 4½ | 118½ | — | 3 16 0 |
| Do. do. B... | ,, | — | 5 | 120½ | — | 4 3 0 |
| Do. do. C... | ,, | — | — | 78½ | — | — |
| West Midlands Joint Elec. 1948–68 | ,, | — | 5 | 113 | — | 4 8 6 |
| **Telegraph and Telephones.** | | | | | | |
| American Tel. & Tel. ... ... | $100 | 9 | 9 | 115½ | — | 7 15 10 |
| Anglo-Am. Tel. Pref. ... ... | Stock | 6 | 6 | 113½ | +½ | 5 5 9 |
| Do. Def. ... ... | ,, | 1½ | 1½ | 28 | — | 5 7 2 |
| Cables & Wireless 5½% Pref. ... | ,, | 2¾ | 2¾ | 72½ | +1 | 3 15 10 |
| Do. A. 7½% Ord. ... ... | ,, | Nil | Nil | 23 | +1 | — |
| Do. B. Ord. ... ... | ,, | Nil | Nil | 10 | — | — |
| Globe Tel. and T. Ord. ... ... | 10 | Nil | 2½ | 9¾ | — | 2 11 3 |
| Do. do. Pref. ... ... | 10 | 6 | 6 | 12¾ | — | 4 13 4 |
| Great Northern Tel. ... ... | 10 | 20 | 20 | 37½ | –½ | 5 6 8 |
| Marconi-Marine ... ... | 1 | 10 | 7½ | 30/9 | –⅛ | 4 17 7 |
| Oriental Telephone Ord. ... ... | 1 | 12 | 12 | 5½ | — | *3 16 10 |
| **Home and Foreign Trams, Etc.** | | | | | | |
| Anglo-Arg. Trams First Pref. ... | 5 | Nil | Nil | 2/- | — | — |
| Do. do. 2nd Pref. ... ... | 5 | Nil | Nil | 1/6 | — | — |
| Do. do. 5% Deb. ... ... | Stock | Nil | Nil | 6 | — | — |
| British Electric Traction Df. Ord. | ,, | 5 | 5 | 620 | +20 | — |
| Do. do. Pref. Ord. ... ... | ,, | 8 | 8 | 157½ | — | 5 1 7 |
| Brazil Traction ... ... ... | 100 | — | — | 11½ | +½ | — |
| Brit. Columbia Elec. Rly. Pce. ... | Stock | 5 | 5 | 102½ | — | 4 17 6 |
| Mexico Trams, 5% Bonds ... | — | 5 | 5 | 19½ | — | 25 12 8 |
| Mexican Light Common ... ... | 100 | Nil | Nil | 8 | — | — |
| Do. 7% Pref. ... ... ... | 100 | 7 | 7 | 11 | — | — |
| Do. 1st Bonds... ... ... | — | 5 | 5 | 50½ | — | 9 18 0 |
| Victoria Falls Ord. ... ... | 1 | 15 | 20 | 5⅜ | — | 3 7 4 |
| Yorkshire (West Riding) ... ... | 1 | 2½ | 5 | 18/9 | — | 5 6 8 |
| **Manufacturing Companies.** | | | | | | |
| Assoc. Elec. Ord. ... ... ... | 1 | 4 | 3 | 17/9 | +1/6 | 3 7 7 |
| Do. Pref. ... ... ... | 1 | 8 | 8 | 31/3 | — | 5 2 5 |
| Babcock & Wilcox ... ... | 1 | 14 | 9 | 45/9 | — | — |
| British Aluminium Ord. ... ... | 1 | 5 | 5 | 29/0xd. | +9d. | 3 9 0 |
| British Insulated Ord. ... ... | 1 | 15 | 15 | 70/-xd. | –⅛ | 4 5 8 |
| Brush Ord.... ... ... | Stock | Nil | Nil | 35 | –3 | — |
| Callender's... ... ... ... | 1 | 15 | 15 | 57/6 | — | 5 4 4 |
| Do. 6½% Pref.... ... ... | 1 | 6½ | 6½ | 30/9 | — | 4 4 6 |
| Crompton Parkinson Ord ... | 5/- | 22½ | 12½ | 25/- | — | — |
| Do. 8% Pref. ... ... ... | 1 | 8 | 8 | 31/3 | — | 5 2 5 |
| Edison-Swan 1st Pref. ... ... | 1 | 7½ | 7½ | 24/6 | — | 6 2 5 |
| Do. 5% Deb. ... ... | Stock | 5 | 5 | 102½ | — | 4 17 7 |
| Electric Construction ... ... | 1 | Nil | Nil | 11/3 | +⅛ | — |
| Enfield Cable Ord. ... ... | 1 | 25 | 25 | 85/- | — | 4 14 1 |
| English Electric ... ... ... | 1 | Nil | Nil | 7/6 | — | — |
| Do. do. Pref. ... ... | 1 | Nil | Nil | 7/6 | — | — |
| Ever Ready ... ... ... | 5/- | 35 | 35 | 29/6 | — | 5 18 8 |
| Ferranti Pref. ... ... ... | 1 | 7 | 7 | 26/- | — | 5 7 9 |
| G.E.C. Pref. ... ... ... | 1 | 6½ | 6½ | 30/9 | +9d. | 4 4 5 |
| Do. Ord. ... ... ... | 1 | 8 | 8 | 42/- | — | 3 16 1 |
| Henley's ... ... ... | 1 | 30 | 30 | 6 | — | 4 17 10 |
| Do. 4½% Pref.... ... ... | 5 | 4½ | 4½ | 5½ | — | 4 5 9 |
| India-Rubber Preferred ... ... | 1 | — | — | 15/- | — | — |
| Johnson & Phillips ... ... | 1 | 5 | 5 | 1 | — | 5 0 0 |
| Siemens Ord. ... ... ... | 1 | 7½ | 6½ | 18/9 | — | — |
| Telegraph Construction ... ... | £1 | Nil | Nil | 23/9 | — | — |

* Dividends paid free of Income Tax.

# Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and all subsequent proceedings will be taken.

**1932**

17638. "Automatic frequency-regulating arrangements for alternating-current supplies." General Electric Co., Ltd., and J. W. Gibson. June 22nd, 1932. (407401.)

19477. "Electric illuminating devices." M. Adams, R. F. Howe and P. G. Nutting. July 9th, 1931. (407344.)

21323. "Metal-vapour or rare-gas arc rectifiers." L. Mellersh-Jackson (Siemens-Schuckertwerke Akt-Ges.) July 28th, 1932. (407315.)

22240. "Interconnection of tubular electric heaters." Edison Swan Electric Co., Ltd., and F. Shergold. August 8th, 1932. (407347.)

22772. "Thermionic valve amplifier circuits." E. Y. Robinson and Associated Electrical Industries, Ltd. August 13th, 1932. (407317.)

23005. "Automatic train control systems." A. E. Hudd. August 16th, 1932. (407382.)

23086. "Photo-electric cells." A. L. Williams and Westinghouse Brake & Saxby Signal Co., Ltd. August 17th, 1932. (407383.)

24630. "Cathode-ray and like electric discharge devices and luminescent screens for use therein." Telefunken Ges für Drahtlose Telegraphie. September 4th, 1931. (407318.)

24860. "Multi-circuit lamp sockets or like fittings." P. Kragelosh. September 6th, 1932. (Cognate application 36123/32.) (407319.)

24972. "Compressed-air brake systems and apparatus for tramway and railway vehicles." G. D. Peters & Co., Ltd., and A. S. Porter. September 7th, 1932. (407349.)

25080. "Television transmission systems." Marconi's Wireless Telegraph Co., Ltd. September 18th, 1931. (407322.)

25109. "Method of producing high-emission thermionic cathodes." Dr. S. Loewe and B. Wienecke. September 11th, 1931. (407334.)

25207. "Fitting for electric immersion heaters." H. H. Berry and C. A. Painton. September 9th, 1932. (407352.)

25346. "Arrangement of auxiliary dynamo-electric machines employed as generators and starting motors for internal-combustion engines." W. Beardmore & Co., Ltd., and H. D. Bush. September 12th, 1932. (407337.)

25350. "Electrical overload devices responsive after a time lag." Igranic Electric Co., Ltd., and A. H. Mackley. September 12th, 1932. (407369.)

25594. "Apparatus for the measurement of electrical resistance." M. G. Scroggie. September 14th, 1932. (407341.)

25670. "Electric circuit-interrupters." Westinghouse Electric & Manufacturing Co. October 13th, 1931. (407354.)

25765. "Method of producing electric discharge tubes." Dr. S. Loewe. September 19th, 1931. (407373.)

25796. "Thermionic valves." S. P. de Laszlo. September 16th. 1932. (407388.)

26032. "High-voltage testing apparatus." British Thomson-Houston Co., Ltd., and R. T. Coe. September 19th, 1932. (407396.)

26058. "Amplifying circuits employing thermionic valves." F. B. Dehn (C. E. Elwell and F. E. Terman.) September 19th, 1932. (407398.)

36366. "Carrier-wave signalling systems." Standard Telephones & Cables, Ltd., F. Ralph and V. J. Terry. September 22nd, 1932. (407404.)

26367. "Electromechanical devices such as instruments for recording, reproducing, or transmitting sound." Standard Telephones & Cables, Ltd., E. K. Sandeman and J. F. Atherton and R. W. Hardisty. September 22nd, 1932. (407405.)

26385. "Television systems." Marconi's Wireless Telegraph Co., Ltd. September 30th, 1931. (407409.)

26703. "Regulating choke coils." International General Electric Co., Inc. September 25th, 1931. (407411.)

26743. "Means for tuning wireless receiving apparatus." S. W. Alldridge. September 27th, 1932. (Cognate application 18031/33.) (407412.)

27213. "Means for operating a plurality of electric switches by a single operating member." Corey, Parsons & Co., Ltd., D. W. Sayer and J. E. M. Roe. September 30th, 1932. (407421.)

30047. "Sound amplifiers." H. Kanders. October 26th, 1931. (Addition to 228905.) (407438.)

30128. "Electric secondary clocks." Ericsson Telephones, Ltd., H. J. Moore and C. W. Wilman. October 27th, 1932. (407440.)

31785. "Electric protective arrangements." Electrical Improvements, Ltd., H. B. Poynder and G. S. Lisle. November 10th, 1932. (407454.)

31946. "Means for preventing undesired arc formation in electric discharge apparatus." Allmänna Svenska Elektriska Aktiebolaget. November 14th, 1931. (407455.)

32161. "Valve voltmeters." General Electric Co., Ltd., N. R. Bligh and C. N. Smyth. November 14th, 1932. (407458.)

32292. "Electric lighting fittings for aerodrome lighting and other purposes." General Electric Co., Ltd., and L. W. Barsdorf. November 15th, 1932. (407459.)

33804. "Magnetos." British Thomson-Houston Co., Ltd., L. Griffiths, C. J. Morton and S. H. Franklin. November 29th, 1932. (407469.)

34410. "Loud-speakers." General Electric Co., Ltd., and F. Clark. December 5th, 1932. (407474.)

34792. "Electric tumbler switches." C. L. Arnold and M. K. Electric, Ltd. December 8th, 1932. (407476.)

36290. "Electromagnetic selectors." General Electric Co., Ltd., and R. M. Hamilton. December 22nd, 1932. (Cognate application 6198/33.) (407488.)

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236. "Electrically controlled means for opening doors." W. Newman & Sons, Ltd., and H. C. Shead. January 4th, 1933. (407493.)

939. "Rotary electric switches." V. G. Van Coole and Ward & Goldstone, Ltd. January 11th, 1933. (407498.)

4811. "Liquid-tight stator winding for a submersible electric motor." F. Sigmund and J. Sigmund (trading as Sigmund Pumpen Brüder Sigmund). February 16th, 1932. (407515.)

5700. "Mosaic electrode structures for use in cathode-ray apparatus for television and similar purposes and methods of manufacture of the same." Marconi's Wireless Telegraph Co., Ltd. February 24th, 1932. (407521.)

7209. "Oscillatory systems suitable for use for wireless signalling and similar purposes." Marconi's Wireless Telegraph Co., Ltd. March 19th, 1932. (407529.)

7868. "Electrolytic treatment of gases and vapours." Soc. Anon. Le Carbone. April 28th, 1932. (407531.)

8855. "Electric motors." Electrofan Ges. January 18th, 1933. (407532.)

8856. "Small electric motors." Electrofan Ges. February 13th, 1933. (407533.)

10719.—"Luminescent screens and methods of producing luminophores for use therein." Telefunken Ges. für Drahtlose Telegraphie. April 8th, 1932. (407542.)

10820. "Thermionic amplifiers." Telefunken Ges. für Drahtlose Telegraphie. April 11th, 1932. (407540.)

14759. "Luminous electric discharge lamps." General Electric Co., Ltd. May 23rd, 1932. (407565.)

15132. "Electrically-operated time-controlled alarm mechanism." Soc. Industrielle d'Horlogerie et d'Appareils Electriques Sinel. May 28th, 1932. (407567.)

15162. "Electric razors and blades therefor." Tark Electric Razor Co., Inc., and S. Shaler. June 6, 1933. (407571.)

16226. "Arrangements for automatically controlling the playing of gramophone records." General Electric Co., Ltd., and H. C. E. Jacoby. June 4th, 1932 (Divided application on 12763-32). (407399.)

17883. "Electric torches and flash lamps." Ward and Goldstone, Ltd., and S. Goldstone. June 23, 1933. (407581.)

17987. "Time switching devices." C. H. F. Muller Akt.-Ges. July 5th, 1932. (407583.)

18865. "Mounting arrangements for cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd. July 1st, 1932. (407587.)

19318. "Arrangements for producing alternating currents using discharge devices." Allmänna Svenska Elektriska Aktiebolaget. July 8th, 1932. (407589.)

20383. "Methods for the electrical signalling of instrument readings." L. L. E. Chauveau. August 1st, 1932. (407592.)

20963. "Switch applicable for use in regulating electrical appliances such as hot-plates, heaters, and the like." Aktieselskapet Elektrisk Bureau. July 28th, 1932. (407595.)

20975. "Electrical heating apparatus." Unity Heating, Ltd., and D. G. Petrie. July 25th, 1933. (407596.)

21281. "Holders for arc-welding electrodes." British Thomson-Houston Co., Ltd. July 29th, 1932. (407598.)

21381. "Mica condensers." Porzellanfabrik Kahla. July 29th, 1932. (407599.)

21734. "Spark-gap apparatus for producing electric oscillations." M. L. Y. de Paniagua. August 3rd, 1932. (407602.)

22214. Means for transmitting line signals to moving trains." G. Kofler and W. Baseler. August 8th, 1933. (407606.)

24922. "Acoustic signalling apparatus." J. G. M. Broden. September 8th, 1933. (407618.)

24950. "Control of vapour-arc rectifiers." English Electric Co., Ltd., J. E. Calverley and W. R. Evans. September 8th, 1933. (407619.)

25610. "Electrically-operated gas lighters." C. G. Hodges. September 15th, 1933. (407621.)

27026. "Electric switch devices for the control of pneumatic machines." E. Godillot. October 1st, 1932. (407628.)

30627. "System for signalling breakdowns in the filaments of thermionic valves." Lignes Télégraphiques et Téléphoniques. November 14th, 1932. (407645.)

31135. "Switching arrangement for the current in the killing of whales by electricity." Aktieselskapet Elektrisk Hvalskytning. November 8th, 1932. (407647.)

31216. "Safety arrangement for use in the killing of whales by electricity." November 9th, 1932. Aktieselskapet Elektrisk Hvalskytning. (407648.)

32670. "Transmitting devices for ultra-short waves." J. Pintsch Akt.-Ges. and Dr. K. Kohl. December 6th, 1932. (407652.)

33089. "Cathode-ray tubes." M. Von Ardenne. June 19th, 1931. (Divided application on 16998/32). (407377.)

# Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 4th:—

Decca. No. 546863. Class 6. Dynamos, electric fans, blowers, motors and refrigerating machines. No. 546866. Class 18. Electric heating apparatus for buildings, and electrically heated washing coppers and refrigerating chambers.—Decca Record Co., Ltd., Burlington Road, New Malden, Surrey.

Metrovac. No. 548856. All goods in Class 6.—Metropolitan-Vickers Electrical Co., Ltd., Bush House, Aldwych, W.C.2.

Laminic. No. 538329. Class 13. Stampings for electric transformer cores.—Magnetic & Electric Alloys, Ltd., Lancelot Road, Wembley, Middlesex.

Vulcanex. No. 547416. Class 16. Porcelain bodies for electrical heating apparatus.—Steatite & Porcelain Products, Ltd., Bewdley Road, Stourport, Worcestershire.

## I.E.E. Golf Competition

The golf tournament, including play for the G. P. Dennis trophy, organised in aid of the I.E.E. Benevolent Fund by the Mersey and North Wales (Liverpool) Centre, will take place on May 23rd on the links of the Royal Liverpool Golf Club at Hoylake. The distribution of prizes, given by a large number of electrical companies, will take place after dinner at the Club House. The hon. golf organising secretary is Mr. E. Walton, 3, Cowdray Road, Southport.

# New Work for Contractors

## Particulars of new works and building schemes for the use of electrical installation contractors and traders

*Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Aberystwyth.**—Houses (200), Llanbadarn Road, for Andreas Jones.

**Altrincham.**—Houses (100), Glazebrook Hall Estate, Glazebrook Lane; Reality Development Co., Ltd., builders, Bath Street.

**Anstruther.**—Cinema, Crichton Street; Mr. and Mrs. Fuller, Gateside.

**Barking.**—Factory, industrial centre; Holmes Marine Life Protection Association, Ltd.

**Barrow-in-Furness.**—Houses (200), Risedale Estate, and 115 houses, Roosegate Estate; borough engineer.

**Billingham-on-Tees.**—Houses (164) and shops, High Grange Estate; Harland and Parker, builders, York Road, West Hartlepool.

**Birkenhead.**—Tenements (£21,047); J. Dolan & Son, Ltd., builders, Warrington.

**Birmingham.**—Flats, Emily Street (£89,130), maisonettes, Waterloo Farm Estate (£56,000), and 304 flats, Sycamore Estate; library, Yardley Wood (£13,750), and senior school, Audley Road (£17,900); city engineer.

**Blackpool.**—Indoor swimming bath, Pembroke Estate (£9,020), for Corporation. School (440 places), Hawes site; borough engineer.

**Bournemouth.**—Swimming bath (£64,000) for Corporation.

**Bradford.**—Houses (112), Leeds Road; J. N. Naylor & Son, builders, Lee Mount, Halifax. Houses (36), Lower Rushton Road; James Totty & Son, builders, Stanacre Place. Houses (137), Pendragon Estate, Bolton Road; E. A. Gadie, builder and contractor.

**Braintree.**—Cinema; Shipman & King, 24a, Charing Cross Mansions, London, W.C.

**Bridlington.**—Senior school, Priory Butt Estate; Jacques & Grieves, Ltd., builders, Springwell Lane, Balby, Doncaster.

**Brighton.**—Reconstruction of Corn Exchange (£30,250); R. Atkinson, architect.

**Bristol.**—Houses (88) (£25,529); E. A. W. Poole & Son, builders. Houses (300), Horsfield Estate; city engineer. Houses (50), Southmead Estate (£13,462); John Knox, builders.

**Bromley** (Kent).—Houses (112), North Cray; J. Ferdinando. Cinema, near Bromley North Station; Oscar Deutsch, Odeon Cinema Theatres.

**Buckinghamshire.**—Secondary schools, Slough, for County E.C.; director of education, Aylesbury.

**Burnopfield.**—Houses (50); N. T. Barker, builder, Winlaton Mill.

**Cambridgeshire.**—Senior school, Fen Ditton, for County E.C.; director of education, Cambridge.

**Cannock.**—Schools, Chadsmoor, for Chadsmoor National School managers; secretary.

**Canvey Island.**—Cinema and assembly hall; P. Gallagher, Ltd., builders.

**Cardiff.**—Reconstruction of Howard Gardens High School (£17,296), for E.C.

**Chadderton.**—Houses (900), Whitegate Estate, for the Whitegate Gardens Village Co.; Peter Cummings, architect, 27, King Street West, Manchester.

**Cheltenham.**—Houses (72), Eldon Road; Wheeler & Mansell.

**Chesterfield.**—Houses (71), Springfield Estate (£20,907); Wm. Drabble & Sons.

**Coventry.**—Cinema. Walsgrave Road, for Plaza (Coventry) Ltd.; H. T. A. Philpot, managing director.

**Cowley.**—Houses (32), Horspath Road; Isis Properties, Ltd.

**Dartford.**—Church, Hartley, for the Congregational trustees; secretary.

**Derbyshire.**—School, Springfield Road, Swadlincote, for County E.C.

**Douglas** (Isle of Man).—School, Pulrose Housing Estate, for County E.C.; E. Moore, director of education.

**Dudley.**—Houses (66), Wolverton Estate (£26,909); J. Webb, Coseley.

**Dumfries.**—Houses (44) (£13,000); burgh surveyor.

**Durham.**—Houses (107); housing architect, Byland Lodge, Hawthorn Terrace. Houses (100), Sherburn Road, and 900 houses, five years' housing programme; W. J. Green, city engineer. Schools, Horden, Shotton, and extensions to Blaydon, Durham Girls' County and Ryhope schools, for County E.C.; F. Willey, architect, 34, Old Elvet.

**Edenbridge** (Kent).—Factory, Malpit Hill; E. R. Prince, Staincliffe, Station Road East, Oxted, Surrey.

**Ellesmere Port.**—Market hall, &c. (£15,000); R. H. Kelly, U.D.C. architect.

**Enfield.**—Central fire station (£25,000); U.D.C. surveyor.

**Essex.**—Schools, Nutberry Estate, Grays, Dagenham (£47,093), and Chipping Ongar (£20,194), for County E.C.; director of education, Chelmsford. Nurses' home, Romford Institution (£32,000), and extensions, Eastern Counties Institution, Colchester (£15,000); county architect, Chelmsford.

**Folkestone.**—Cinema; E. A. Stone, architect, 20, Berkeley Street, London, W.

**Gloucester.**—Block of offices (£10,645), for C.C.; Spackman & Son, builders, Swindon.

**Gorebridge** (Midlothian).—Houses (92); offices, County Rooms, Edinburgh.

**Guildford.**—Houses (120), Gravetts Lane, Liddington Hall Estate Co. Houses, Woking Road, and houses, Bellfields Estate; R. C. Whitemore, Worpleston Road.

**Hastings.**—Houses (152) and flats; borough surveyor.

**Hayes** (Kent).—Station, with shopping arcade (£14,000), for Southern Railway Co., Ltd.

**High Wycombe.**—Houses (318), Desborough Castle site; Eadie & Co., builders, Wolverhampton.

**Horsham.**—Houses (40), Roffey; U.D.C. surveyor.

**Huddersfield.**—Re-erection, Waterloo Bridge Works, for Arthur Farrar & Sons (£20,000).

**Hull.**—Equipment, mental institution, extension (£13,323); medical officer.

**Ilford.**—Isolation hospital extensions (£47,370); G. H. Mills & Co., Ltd., builders.

**Irish Free State.**—(Castletown Berehaven, Co. Cork).—School, for County E.C., 27, Tuckey Street, Cork; D. J. Tierney, architect, 85, South Mall, Cork. (Cork).—Houses (78), Garranbraher; J. R. Boyd Barrett, architect, 61, South Mall.

**Kendal.**—Houses (120) for the Kendal and District Housing Society; A. Baines & Sons, builders.

**Kent.**—Extensions to Medway Hospital, Chatham (£38,500) for C.C.; Mr. Robinson, county architect, Maidstone.

**Kirkcudbright.**—Houses; W. A. MacKinnell, architect, Town Hall.

**Kirkheaton.**—Reinstatement after fire to mills; A. Farrar & Sons (Huddersfield), Ltd., Waterloo Bridge Works.

**London.**—(Blackheath).—Cinema, Old Dover Road, for M. Sampson, 123, Shooters Hill Road; B. Crewe, architect, 75-77, Shaftesbury Avenue, London, W. (Edmonton).—Elementary school, Cuckoo Hall Lane, for E.C.

**Lymm** (Cheshire).—Houses (178) and shops, Statham, for Drury & Gomersall.

**Maidstone.**—Houses (90), Ringlestone Estate; borough surveyor. Cinema for Dan Benjamin, Palace Cinema.

**Manchester.**—Houses (452), Wythenshawe Estate (£150,000); city architect. School, Haveley Hey; G. & W. Smith (Builders) Ltd.

**Newcastle-on-Tyne.**—Houses (250), Fergusons Lane Estate, and flats, Scotswood; R. G. Roberts, architect, 18, Cloth Market.

**Newport** (I.o.W.).—Houses (34), Heytesbury Estate; Smith & Whitehead, Ltd.

**Newport** (Salop).—Houses (100); R.D.C. surveyor.

**Newton Grange** (Midlothian).—Houses (150); Offices, County Rooms, Edinburgh.

**Oldham.**—Houses (90), Waterhead; J. Clarke, builder, 12, Napier Street, Waterhead.

**Orpington.**—Church, Poverest Road, for the Baptist trustees; Rev. P. N. Bushill.

**Oxford.**—Houses (145), Rose Hill Estate (£44,260); Coop Bros., Ltd. Elementary school, Cowley, and school extension, Headington, for E.C. Extensions, St. Edward's School, Woodstock Road; Governors.

**Peterborough.**—Church, Cromwell Road; E. E. Colman, architect, King's Lynn. Schools, Wittering, for Soke of Peterborough E.C.; Traylen & Lenton, architects.

**Plymouth.**—Factory extension, Prince Rock; Acheson, Ltd. School, Military Hospital site; city engineer.

**Pontefract.**—Houses (103), Ladybalk Estate; W. Horner & Son (Contractors), Ltd.

**Prestonpans.**—Houses (40); F. W. Hardie, County architect, County Buildings, Haddington.

**Rawtenstall.**—Town Hall, Newhallhay Estate, Architectural Competition; borough engineer.

**Ripon.**—Swimming pool, &c. (£5,950); city surveyor.

**Rochester.**—Houses (24), Smith Street; Thompson & West, builders. Houses (24), Darnley Road; city surveyor. Extensions, St. Bartholomew's Hospital; Read & MacDonald, architects, 2, Bloomsbury Place, London, W.C.

**St. Helens** (Lancs).—Houses (64); borough engineer.

**Salford.**—Houses (36), Oakwood Estate, Irlam o' th' Heights; J. Lane & Sons, Ltd., builders, Prestwich Garden Village, Prestwich. St. Clement's schools (£8,000); F. Thorpe, architect, Union Bank Chambers, Oldham.

**Scarborough.**—Church, Murray Street; T. B. Jowsey & Sons, builders, Brook Street.

**Sheffield.**—Houses (29), Richmond Road; J. Newman. Houses (52), Sackville Road; R. T. Hinchliffe & Sons, Ltd.

**Shiregreen** (Near Sheffield).—Cinema, &c., Beck Road; C. B. Malam Wilson, architect, Campo Chambers, Sheffield.

**Skegness.**—Isolation hospital; U.D.C. surveyor.

**Somerset.**—Police buildings, Weston-super-Mare (£28,000), for C.C.; W. J. Pople & Co., builders, Burnham-on-Sea.

**Staffordshire.**—Technical college, Stafford, with electrical and heating work, for County E.C.; director of education, Stafford.

**Stockton-on-Tees.**—Houses (336), Eastbourne Estate; G. P. Stainsby, architect, 25, High Street.

**Stoke-on-Trent.**—Two schools, Carmountside Housing Estate, for City E.C.; director of education.

**Stourbridge.**—Houses (108), Parkfield Estate; A. & J. Mucklow.

**Surrey.**—School, Great Tattenham Way, Banstead, for County E.C.; secretary, Kingston-on-Thames.

**Sutton Coldfield.**—Bus station extensions, Asman Square; Yorkshire Electric Tramways, Ltd.

**Tweedmouth.**—R.C. school (£5,000); R. Burke, architect, 12, Grey Street, Newcastle-on-Tyne.

**Ventnor.**—Hospital block; U.D.C. surveyor.

**Warrington.**—Houses (416), Hallfields Road; G. Smith.

**West Wickham** (Kent).—Houses (54), Rosewalk and Silver Lane, for Nursery Estate, Ltd.

**Wiltshire.**—Extensions to Assize Court, electrical and heating work, for C.C.; F. Rendell & Sons, Ltd., builders, Devizes.

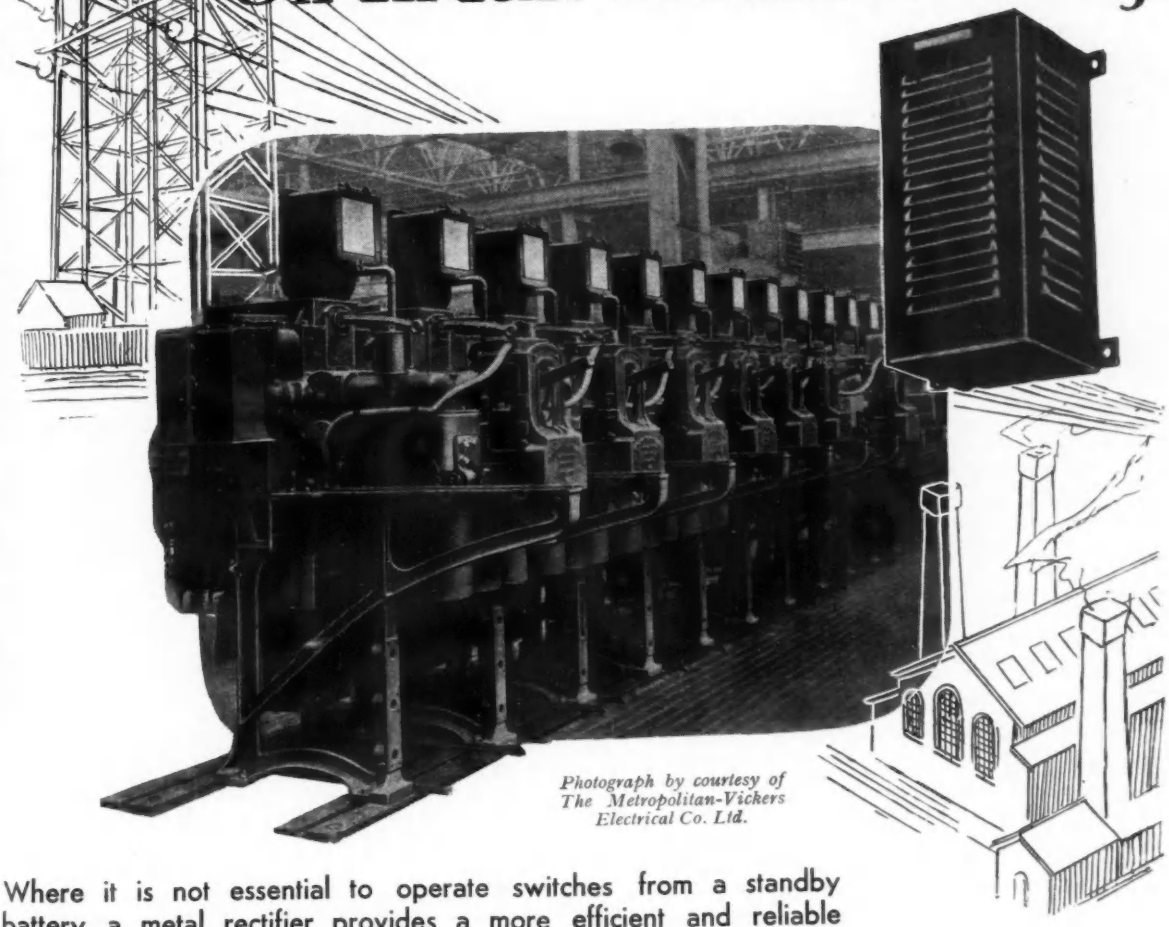
**Windsor.**—Mineral water factory, Maidenhead Road, for the Direct Supply Aerated Water Co., Ltd.

**Wolverhampton.**—Two cinemas, Cannock Road; Satchwell & Roberts, architects, Birmingham. Public hall (£100,000); Mr. Cowles-Voysey, assessor.

**Worthing.**—Houses (30), Ardsheal Road; J. A. Tarry, Ltd. Cottage homes for Pearson Trust (£25,000); library, Dominion Road, extensions to museum and art gallery, and pier pavilion (£10,000); borough engineer.

**York.**—Houses (176) and flats, Huntington Road Estate; F. W. Spurr, city engineer. Houses (64), Salisbury Road; A. Temple. Church, Burton Stone Lane; Lendal Congregational trustees.

# Metal Rectifiers *for* Oil Circuit Breaker Closing



*Photograph by courtesy of The Metropolitan-Vickers Electrical Co. Ltd.*

Where it is not essential to operate switches from a standby battery, a metal rectifier provides a more efficient and reliable means of closing oil-circuit breakers, etc., than the more usual motor.

The Metal Rectifier needs none of the attention and maintenance associated with the alternative method, and will certainly outlast the actual switchgear.

Not the least important advantage of a metal rectifier is its convenience. It is static. It needs no foundations, and may be fixed in any convenient position. Once installed, its reliability makes its presence forgotten.

The rectifiers are designed on a rating of 30 seconds load per hour, and represent the best means yet devised for operating switches requiring up to 100KW. to energise the solenoid.

The photograph shows a group of oil-circuit breakers such as could be operated by one rectifier only, provided not more than one solenoid is energised at a time. This is done by means of selector switches connected on the D.C. side of the rectifier.

Write for literature D.P.11 E.R.

# Westinghouse

## METAL RECTIFIERS

The Westinghouse Brake & Saxby Signal Co. Ltd., 82, York Road, King's Cross, London, N.1

## COMPANY MEETING.

### THE BRITISH THOMSON-HOUSTON CO., LTD.

The thirty-ninth Ordinary General Meeting of the shareholders of The British Thomson-Houston Company, Limited, was held on Wednesday, April 11th, 1934, at the company's offices, Crown House, Aldwych, London, W.C.2.

The notice convening the meeting and the report of the auditors having been read,

The Chairman (Mr. William C. Lusk) said: Gentlemen,—The report and accounts have been in your hands for some time, and with your permission we will take them as read.

The profit for the year, after deducting all expenses and charges other than interest on Debentures and loans and after providing for income-tax, was £256,948 (as compared with £392,015 for the previous year), to which there is to be added the amount brought forward from the previous year, £227,795, making the total to be dealt with £484,743.

After deducting interest on Debentures and loans, £83,665, and depreciations, £92,886, there is a balance left of £308,192. Out of this a dividend on the Preference Shares at 7 per cent. per annum less income-tax has been paid, amounting to £78,749, which leaves £229,443 to be carried forward to the new account (as against £227,795 for the previous year).

The item of sundry creditors, retentions, etc., stands at £774,885 (as compared with £997,138 for the previous year), and on the other side sundry debtors, retention moneys, etc., is £1,210,129 (against £1,232,349 for the previous year). The item of apparatus, supplies, etc., finished and in process of manufacture, less reserves, at £1,137,291 is down by £63,954 as compared with the previous year. Investment in shares of subsidiary companies, together with amounts owing by them, stands at £117,548 (as against £188,850 for the previous year). The reduction is due to the liquidation as at January 1st, 1933, of a subsidiary company, the Ladywood Ironworks, Ltd. In the interests of efficiency and economy, the work previously done by that Company has been transferred to our main Works at Rugby. Shares in other companies stand at £357,158, a reduction of £17,640 as compared with the previous year, due to the sale of certain shares during the year. The figure at which the shares in other companies are carried is substantially below their market value at December 31st last. Cash stands at £242,756 and British Government Securities at £589,155, making a total of £831,911 for these two items as compared with a total of £1,026,103 for the same items for the previous year. The reduction of £194,192 is reflected in the reduction of £222,254 in the item of Sundry Creditors, etc.

As mentioned in the directors' report, an agreement was made with the holders of the 6 per cent. debenture stock whereby the rate of interest was reduced from 6 per cent. to 5 per cent. as from 1st January, 1933.

The 4½ per cent. and the 5 per cent. debenture stocks have been reduced by drawings of the amounts required under the respective Trust Deeds.

The amount paid for interest for the year was £83,665, against £99,743 for the previous year.

Our manufacturing plants have, as usual, been well maintained during the year. Capital expenditure on equipment amounted to £80,209, including about £30,000 in connection with the provision of additional facilities for the production of bulbs at our glass works at Chesterfield for our well-known Mazda lamps and the necessary expenditure at our Rugby works to accommodate the work taken over from the Ladywood Ironworks, Ltd., referred to above. We also extended our facilities for the manufacture of certain new lines of domestic appliances, such as B.T.-H. electric refrigerators and Hotpoint electric cookers, washing machines and water heaters, all of which, except the refrigerators, are marketed through our subsidiary company, The Hotpoint Electric Appliance Co., Ltd. We have written off for depreciation of plant account the sum of £81,500, so that notwithstanding having expended more in additions than during the previous year, the nett value of our plant has not been increased; there is a reduction of about £1,300.

At the annual meeting a year ago, I said we could expect 1933 to be a more difficult year for us than the previous year because of the substantial reduction in the amount of business placed during 1932, particularly of orders for the heavier engineering products, which often require many months to complete. That forecast, unfortunately, proved to be correct, and the shipments from our factories during the year were less than for the previous year, and considerably below normal. So far as the electrical manufacturing industry is concerned, the effects of the world-wide depression of 1931 and 1932 extended well into 1933, but during the latter part of the year there was an improvement, and I am glad to say that the amount of business received by your company during the year was greater than for the previous year; also that the prospects for 1934 are better, and that the orders received during the first three months of 1934 exceed those received during the same period in 1933. There is an increase of 10 per cent. in the number of our employees, as compared with a year ago.

There is no doubt that part of the recent improvement in business generally is due to the tariff legislation.

Competition continues to be very severe and to keep prices at too low a level, but I am not without hope that the efforts which are being made to bring about improvement in this position will have some measure of success. A part of this problem is the excess of productive facilities in the industry in almost every line of products.

In the home market the lack of orders for central station generating plant, consequent upon the completion of the Grid system, has been felt severely, but orders from Industrial undertakings such as the paper making, chemical, steel, and artificial silk industries show a gratifying increase and reflect the improved prospects of those industries.

Amongst those orders I might mention a.c. electric drives for two of the largest newsprint machines in the world (one being for Bowater's Mersey Paper Mills and the other for Edward Lloyd's new extension at Kemsley), rolling mill equipment for Thomas Firth & John Brown, Ltd., of Sheffield, and motor-converters for Imperial Chemical Industries, these being the largest ever built for electrolytic service, having a continuous rating of 12,500 amperes.

We have supplied to the B.B.C. two steel tank mercury arc rectifiers for supplying 20,000 volts d.c. power to the transmitters of the new Midland Regional broadcasting station at Droitwich. These are the first rectifiers to be manufactured in this country for such high voltages, and the first to be used for this purpose by the B.B.C.

Amongst interesting installations which went into service during the year are the new Barking Station of the County of London Electric Supply Co., for which we supplied two 75,000 kW turbo generators, the Tummel Hydro-Electric Power Station of the Grampian Electricity Supply Company with two 20,000 kW generators, and the Ironbridge Station of the West Midland Joint Electricity Authority with a 50,000 kW turbo-generator; all of these are selected stations in connection with the Grid Scheme.

As a result of the satisfactory operation of one of our 33,000 volt 22,000 kW turbo type alternators in the Stourport Generating Station of the Shropshire, Worcestershire and Staffordshire Power Company, and as part of the scheme for change in frequency, we have received an order from the Power Company to reconstruct another alternator of the same size for 33,000 volt operation.

In the field of marine propulsion may be mentioned the Union Lighterage Company's Diesel-electric tug "Lectro" which is operating on the Thames with great economy and success, also a Diesel-electric ferry boat "The Electric Star," which is in service at Hong Kong, for both of which vessels we supplied the electrical equipment.

Among the important export orders received during the year were orders for a 22,500 kW turbine for The Shanghai Power Company, a similar machine for Schaerbeek in Belgium, complete power stations for the Ahmedabad Electricity Supply Co. in India, and for the Tantah Municipality in Egypt, a large number of generators for the Iraq Petroleum Company's new pipe line to Haifa, several electric winders and steam turbo alternator sets for South Africa and Rhodesia, and a complete rolling mill equipment for the Broken Hill Proprietary Company of Australia; these examples show a healthy diversity amongst the markets which we serve.

During the year we have added to our lines of well-known Mazda lamps a gas discharge lamp, the Mazda Mercra, for highway and industrial lighting, and demands for it are increasing in a very gratifying manner.

B.T.-H. sound reproducing and talking picture equipments for cinemas and other purposes maintain their premier position. We can now also supply 16 mm. portable equipment of the same excellent quality, for which we anticipate a growing demand for private entertainment, advertising and educational purposes. Behind all the products of our Company lie the work of our research engineers and laboratories, whose time and energies are devoted to technical and practical research to maintain the high quality of the Company's products and to develop and apply new ideas, improve processes and keep the Company in the forefront of scientific investigation and of engineering and manufacturing progress.

I have much pleasure in recording our appreciation of the spirit of loyalty and the excellent work of the Company's officers and employees in all departments, who have at all times endeavoured to promote the Company's interests.

The report of the directors, together with the Company's accounts to December 31st, 1933, were approved and adopted, and the retiring directors and the auditors were re-elected.

HOOPER'S
Telegraph & India-Rubber Works, Ld.
ADELAIDE HOUSE, King William Street, E.C.4. (Established 1860.)
MILLWALL DOCKS, LONDON, E.14.
PURE TAPE AND STRIP &c., &c.
HOOPER'S Vulcanised India-Rubber Cables for Electrical Work maintain the highest quality, and their durability has been proved.
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